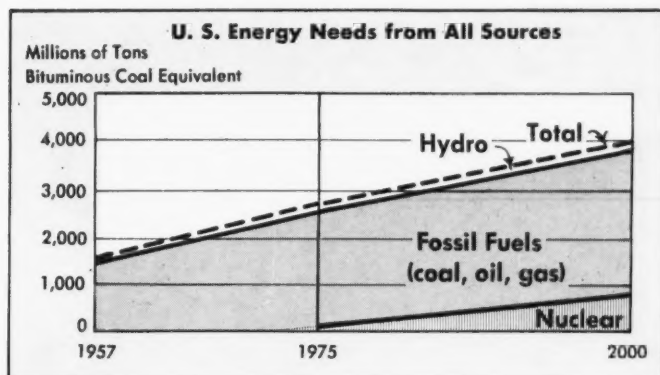


COAL AGE

JANUARY, 1960

PRICE \$1

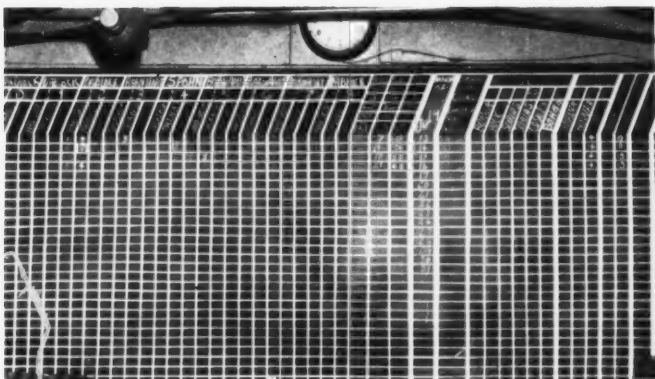
A MCGRAW-HILL PUBLICATION



**Fuels Policy:
Battle in 1960 p 72**



**Preparation: Quality
First—Service Plus . . p 92**



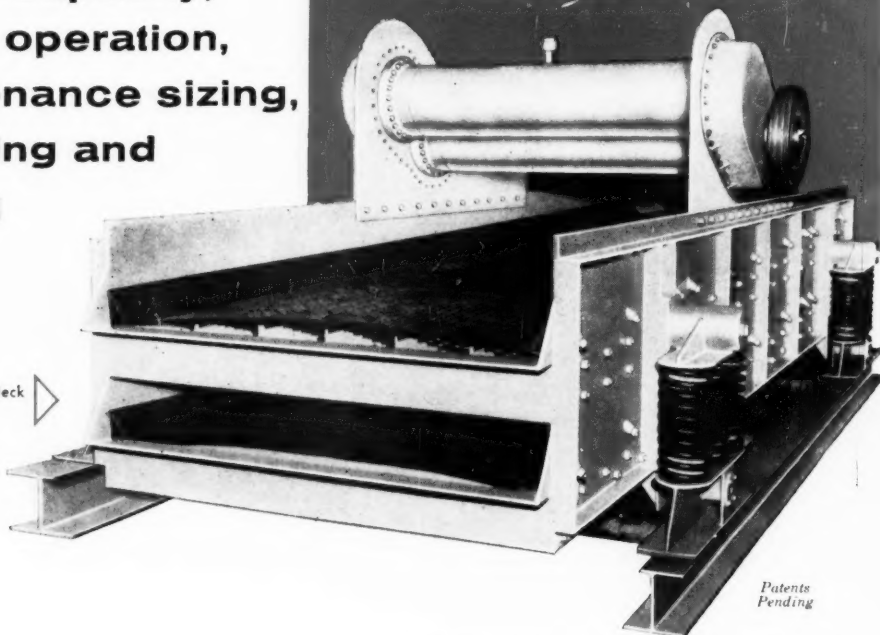
**Putting Preventive Main-
tenance to Work . . . p 104**

LECCO VIB

**for high-capacity,
non-stop operation,
low-maintenance sizing,
dewatering and
conveying**

HORIZONTAL VIBRATING SCREENS

6' x 16' Double Deck
Model 02-24



Patents
Pending

When a Lecco Vib Horizontal Vibrating Screen is on the job, you know you're getting accurate performance under a wide range of operating conditions whether screening from the coarsest to the finest feeds. That's because the Lecco Vib Horizontal Vibrating Screen is designed and built with superior construction which eliminates adjustment and maintenance slowdowns and stoppages. Each recommended Lecco Vib receives personal attention to screening requirement based on proven methods of calculations.

The new Lecco Vib Horizontal Vibrating Screen literally abounds with exclusive features that make it the economical standout of screening equipment for the modern preparation plant, both as to performance and maintenance requirements.

To assure non-stop operation continuously, the Lecco Vib Screen is *base mounted* or cable suspended, when required, without loss of the damp-

ened start and stop control. Thus, vibration is confined entirely to the vibrated frame and not transmitted to the supporting structure and other equipment.

Vibration absorption is pin-pointed to the coil springs installed at each corner of the unit to support the vibrated frame on its base. Friction checks are provided to eliminate erratic motions of the Screen when starting and stopping. Heavy duty plates of the decks are ribbed and stiffened to withstand the abuse of heavy high-capacity loads and vibration.

Exclusive adjustable trunnions position the coil springs of the Lecco Vib to the desired angle of material flow.

Then too, special feed boxes, which allow full advantage of total screening area are built into the side plates of the Screen as an integral part of the main frame.

For complete information about the Lecco Vib Horizontal Vibrating Screen write for your copy of Bulletin L-12-59.

Lecco Machinery and Engineering Co.

BLUEFIELD, WEST VIRGINIA

Subsidiary Fairmont Machinery Company

B.F. Goodrich



Coal travels nonstop on rubber turnpike

B.F. Goodrich improvements in rubber brought extra savings

COAL used to be hauled by trucks from a Kentucky mine to river barges. But trucks couldn't deliver it fast enough, were sometimes slowed down or stopped completely by bad weather. Engineers knew conveyor belts would be faster, would keep the coal flowing at a steady rate. But they wanted to be sure there'd be no costly shutdowns for repairs.

B.F. Goodrich was asked to work on the problem. The type of belt recommended was one B.F. Goodrich had specially developed for jobs like this.

It can carry loads long distances (the belt shown here is nearly a mile long) because of special reinforcing fabric that's stronger than fabric used in ordinary conveyor belts. It's a more flexible belt, can carry coal at high speed without spilling part of it along the way.

The belts were installed, and after more than a year hadn't caused a minute of downtime. One big reason is that this conveyor uses the B.F. Goodrich "turnover" system. The belt turns upside down after dumping the coal, then turns over again before

picking up another load. This way the coal-carrying side of the belt never touches the rollers, so there's no chance of anything sticking to the metal parts or to the belt, and causing wear.

Today, these B.F. Goodrich belts are delivering 800 tons of coal an hour, loading barges *three times faster*.

Your B.F. Goodrich distributor has full information on the conveyor belt described here. And, as a factory-trained specialist in rubber products, he can answer your questions about the many rubber products B.F. Goodrich makes for industry. *B.F. Goodrich Industrial Products Co., Dept. M-773, Akron 18, Ohio.*

B.F. Goodrich *industrial rubber products*



The Wise Bird says . . .

"CLARKSON REDBIRD"

for the very finest in Conveyor Chain

Here's why...

Clarkson Redbird has the welded flight assembly that ends once and for all any need for adjustment, lessens wear and strain, eliminates stripped and corroded threads, loosened and lost nuts. Clarkson Redbird Conveyor Chain is shipped in assembled sections—no need to bolt flights to chain piece-by-piece . . . just join two or three sections to make a complete chain, ready for your hardest service. Ask us for the many supporting reasons for Clarkson Redbird leadership in conveyor chain performance—today!

**National Mine
Service Company**



Koppers Building • Pittsburgh 19, Pa.

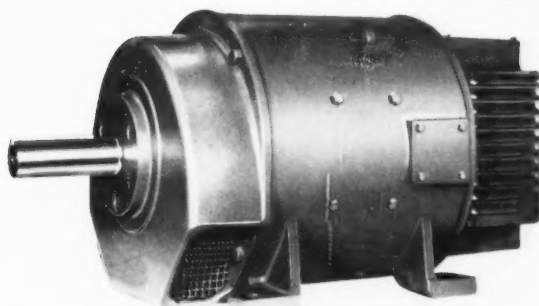
Distributing Divisions: ALL-STATE DIVISION Anthracite Division REMECO DIVISION KY.-VA. DIVISION MOUNTAINEER DIVISION WESTERN KY. DIVISION WHITEMAN DIVISION
Logan, W. Va. Forty Fort, Pa. Beckley, W. Va. Jenkins, Ky. Morgantown, W. Va. Madisonville, Ky. Indiana, Pa.
Manufacturing Divisions: ASHLAND DIVISION CLARKSON DIVISION GREENSBURG DIVISION In Canada: NATIONAL MINE SERVICE (CANADA) LIMITED
Ashland, Ky. Nashville, Ill. Greensburg, Pa. Elliot Lake, Ontario



Tough Reliance D-c. Motors power this mechanical mule

Powerful new Reliance Super 'T' D-c. Traction Motors put muscle in this low-slung mine tractor. Two low-voltage, battery-oper-

ated 5 hp. motors pull a 20-ton pay load at speeds up to 6 mph. Operation is smooth and equally responsive in forward or reverse.



These Reliance Traction Motors, used by a wide variety of manufacturers, withstand punishing overloads in starting loaded trains. Operating conditions are damp and gritty. In spite of this damaging environment, Reliance D-c. Motors have given years of reliable mining service.

This is typical of the performance you get from all Reliance products. Your nearest Reliance Sales Engineer will give you all the pertinent facts. Call him, or write for bulletin C-2501.

C-1604-A

Product of the combined
resources of
Reliance Electric and
Engineering Company and its
Master and Reeves Divisions

**RELIANCE ELECTRIC AND
ENGINEERING CO.**

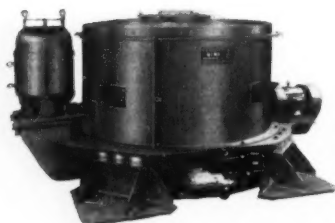
DEPT. 61A, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in Principal Cities



Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V*S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

CHECK THIS COMPARISON CHART BEFORE YOU BUY FINE COAL DEWATERING EQUIPMENT

	✓ BIRD-HUMBOLDT Centrifugal COAL DRYER	Centrifugal COAL DRYER "A"	Centrifugal COAL DRYER "B"
Power	¼ HP per ton	1 HP per ton	1.25 HP per ton
Average screen life	2000-3500 hrs.	36-72 hrs.	48-120 hrs.
Recovery over screen life	98% + (almost no degradation)	85%	85%
Recommended top size of feed	1 ¼"	¾"	¾"
Average surface moisture on ¼" x 0 coal	5.5-7.5%	5-7%	5-7%
Method of coal discharge	By basket oscillation	By scrapers	By scrapers



The Bird-Humboldt Oscillating Screen Centrifugal Coal Dryer delivers ¼" x 28 mesh coal with 5% surface moisture and almost no degradation or loss of solids, at lowest cost per ton including write-off, power and maintenance.

It delivers stoker size (1" x ¼") coal down to 2½% surface moisture or less, likewise with negligible degradation or loss. Thermal drying costs ten times as much.



For detailed specifications, layouts and cost estimates get in touch with us

BIRD-HUMBOLDT Centrifugal Coal Dryer

BIRD MACHINE COMPANY • SOUTH WALPOLE • MASSACHUSETTS

Regional Offices:

EVANSTON, ILL. • ALAMO, CALIF. • ATLANTA, GA.

This Month in

JANUARY 1960

COAL AGE

Features This Month:

Editorial: Comeback in 1960	p 65
The Lewis Era in Coal	p 66
Fuels Policy: Battle in 1960	p 72
Multiple Shooting With Air	p 78
Stripping 36-in Coal in Ohio	p 82
Mining Machine Protection	p 88
Preparation: Quality First—Service Plus	p 92
Moving With the Times	p 100
Maintenance Ideas	
Putting Preventive Maintenance to Work	p 104
Epoxy Insulation Improves Motor Life	p 109
Kentucky Mining Institute	p 114
Coal Mining Institute of America	p 118

Departments This Month:

Coal Commentator	p 11	News Roundup	p 26
Foremen's Forum	p 124	Operating Ideas	p 130
Equipment Developments	p 134		

► Labor

<i>The Lewis Era in Coal</i>	p 66
------------------------------	------

Ivan A. Given, Editor, *Coal Age*

John L. Lewis became head of the United Mine Workers at the end of an era during which production roughly doubled every 10 yr. He gives up formal union leadership as coal enters on a new era of growth and automated production. In the intervening 40 years, World War I overcapacity was liquidated at the same time competition and increased burning efficiency was costing hundreds of millions of tons of business that otherwise would have come to coal. The union went bust in bituminous and was rescued by the New Deal in the early 30s. Since then, Lewis has won major concessions in wages and other benefits, and has repaid in stimulating productivity, in growing cooperation in solving problems and in actual partnership, becoming the "elder statesman" of labor in the process.

And Ahead—An orderly transfer of power and a continuing need for purpose and direction to solve continuing problems and cash in to the utmost on the opportunities ahead.

► Energy Resources

<i>Fuels Policy: Battle in '60</i>	p 72
------------------------------------	------

Congressional hearings the week of October 12, 1959, set the stage for battle this year on whether or not the country should have a coordinated national fuels policy. Statements at the hearings and elsewhere show that coal and competitive-fuel spokesmen are divided on motives, and energy-resources experts on the need, for such a policy. The ultimate criterion: Will fuels resources and the pace of energy technology be adequate to meet the Nation's rapidly expanding energy needs?

Direct from Washington, D. C.—The opening rounds of hearings-testimony on national fuels policy.

► Deep Mining

<i>Multiple Shooting—With Air</i>	p 78
-----------------------------------	------

An increase in shooting capacity was necessary if Green Diamond mine was to stay competitive with large-scale stripping and continuous-mining operations in Illinois. The answer is "Mobile Multiple Shooting" with Airdox at Mid-Continent Coal Corp.'s highly efficient property at Marrisa, Ill. Shotfirer services four shells at a time with one operation of blow-down valve, the shells firing in sequence. The system also includes a battery-powered truck on which the sequence valves are installed and which carries the new, lightweight shells from place to place. The shells are equipped with automatic discharge heads, eliminating a need for changing shear strips.

Added Attraction—Special-purpose vehicles and service units for higher production efficiency.

► Stripping

<i>Stripping 36-in Coal in Ohio</i>	p 82
-------------------------------------	------

Up-to-date equipment for stripping and hauling and well-planned methods lead to higher efficiency in recovering 36-in coal at the operations of Industrial Mining & Engineering Co. The main units employed by the company in recovering the No. 6 seam are a 12-yd drag-

COAL AGE, January, 1960, Vol. 65, No. 1. Published monthly on the 1st by McGraw-Hill Publishing Co., Inc. Publication office, Third & Hunting Park Ave., Philadelphia 40, Pa. United States subscription rate for individuals in the field of the publication \$3 per year; single copies \$1. Second class postage paid at Philadelphia, Pa. For additional information see p. 9.
Postmaster: Please send Form 3579 to Coal Age, 330 W. 42nd St., New York 36, N. Y.

Better products, *faster*, from your National Seal specialist:



How National Oil Seals can help hike coal production while whittling operating costs



Seals . . . a good place to start paring down costly maintenance and curbing downtime

Let National Oil Seals put grit, water and corrosion . . . the bane of bearing life . . . under positive control in your mining equipment. Protect your investment against these constant enemies. Keep your equipment working and earning. Minimize downtime with these better seals which hold lubricants in place. Truly, this small investment pays off in more consistent production and longer equipment life.

National Oil Seals in Micro-Torc leather or Syntech rubber are easy to install and come in sizes and types to fit most every requirement. Your National Seal specialist gives you off-the-shelf delivery on the full line. He is always nearby.

NATIONAL OIL SEALS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 13, MICHIGAN



This Month in Coal Age—Cont'd

line equipped with 165-ft boom, 6½-yd drag with 110-ft boom and a 5-yd drag with 120-ft boom.

How-To Highlight—Use of blasting chart eliminates guesswork in loading holes with ammonium nitrate.

► Electrical Safety

New Mining-Machine Protection p 88

G. P. Benish, Manager, Mining Sales, Electrical Products Div., Joy Mfg. Co.

New device for protecting both men and equipment without the need of a separate frame ground wire includes oscillator and pushbutton station on the machine and a receiving unit in the circuit center at the outby end of the trailing cable. While distinguishing between short circuits and normal overloads, the device always acts to remove power from both machine and trailing cable in case of a short, and to keep power off as long as a dangerous condition exists. It is available for 250 and 500 V DC.

In Supplement—Design, application and operating details, with schematic circuit diagram and illustrations of components.

► Coal Preparation

Preparation: Quality First—Service Plus . . . p 92

Reactivation and improvement of Slab Fork's No. 2 preparation plant and also updating to improve its Alpoca plant have enhanced their market position by producing quality by-product and metallurgical coals and providing joint rail service. These improvements are aimed at: (1) expanding coal markets and services, (2) upgrading products and (3) adding versatility to the operation.

Featured—Flow diagrams of both plants; unique effluent disposal system.

► Preparation, River Loading

Moving With the Times p 100

Lieving Coal Co., with a 57-yr-old property originally opened to serve the domestic market, has shifted in recent years to a primarily industrial operation while still capitalizing on available home and commercial business.

► Maintenance Ideas

Putting Preventive Maintenance to Work . . p 104

A company-planned preventive maintenance program at Delmont Fuel Co., has reduced monthly maintenance delays to less than 10% and has cut labor and supply costs to a minimum. Lubrication cost alone has been

This Month in **COAL**

FAST START—Compared to a little over 8 million tons a week in January, 1959, and much less than that at the end of February, bituminous coal is off to a fast start in 1960. The output rate should be appreciably above 9 million a week throughout the first quarter, and perhaps for the second. This primarily reflects the outlook for steel, in turn reflecting a boom in auto production and other manufacturing.

And for Anthracite—Weather is the big factor. Because of a cold snap earlier January was the peak in 1959. If the weather is right the 1960 peak could again come in January and match that of 1959.

CAR PROBLEM—With total usable hoppers down and a higher demand for such equipment for moving other commodities on top of an increased rate for coal, the car problem is likely to be around for at least a time—some betting is to the middle of the year or later. The impact will be spotty and even though some mines will lose time on occasion there should be enough additions to rolling stock in the relatively near future so that losses now can be made up reasonably soon.

MORE MERGERS—If the pattern of the past continues into the present era, there should be an increase in the number of mergers of coal-producing firms in 1960, this because of a rising trend in production, which has, in the past, tended to stimulate amalgamations and acquisitions. Some already in the discussion stages should be completed this year, and initiation of negotiations for others can be expected. It is conceivable that one or more of these could jump the percentage controlled by one company from the present 6 or 7% in bituminous to 10% or more. However, a percentage of that magnitude still appears to be a while off.

TAX RELIEF?—Taxes will be one of the major questions before Congress in the session which resumed this month. A major issue will be depletion rates. What are the prospects for revisions? Oil may get less favorable treatment on foreign production but there is not likely to be any change, even of a minor nature, in U. S. rates for oil and gas in spite of administration and other endorsement of the idea. By the same token, coal probably will not be accorded any increase. But more pressure will be built up and a change may come in another year or so. Corporate and personal income taxes? Some juggling but probably no basic changes.

COMPETITION—A start-of-the-year look at the plans of oil and gas show nothing startling in 1960 from the standpoint of increased competition. On the oil side, in the industrial and power-plant field, there will be some increase in the pressure of imports, though coal and rail cuts should prevent any major rise. Canadian gas eventually may be a major new factor, but not in 1960, while the domestic variety will plug along about as usual.

And in Pipelining—1960 could well see the start of construction of at least one new line to carry coal.

AND RATING—Dun & Bradstreet is now requesting statements, and with the request offers a new booklet on "How to Build Profits by Controlling Costs."

Now—more light, less weight, longer life with **NEW EDISON MODEL S ELECTRIC CAP LAMP**

MSA announces another new *high* in lighting efficiency in the world's most popular cap lamp. Increased light output of the new Edison Model S Lamp assures greater safety for the miner, more tons per shift for the operator. Let's face a fact: Dimness costs money. *Fair* lighting does only a *fair* job. Maximum lighting—the brilliant, unfailing Edison Model S kind—helps get jobs done with top speed and safety. And

the simplified method of charging new Model S Batteries—with the AUTOMATIC LOW-VOLTAGE SYSTEM—is convenient, thrifty and highly efficient. Lets miners take their lamps and rack them—quickly—without loss of time or waste motion. When planning a new lamp-house installation or modernizing your present one, call in the MSA Representative. MSA can help you solve your lighting problems.



Newly issued U.S. Bureau of Mines Approval 6D-31, April 16, 1959.



MINE SAFETY APPLIANCES COMPANY • 201 North Braddock Avenue, Pittsburgh 8, Pennsylvania

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED • Toronto, Calgary, Edmonton, Montreal, Sydney, Vancouver, Winnipeg

Look how small the headpiece is. Weighs only a few ounces. Feels even lighter on the head. You get a clear, sharp spot every time.

Increase in working light appeals to me. This new Edison Model S gives 15% more than we ever had before. And they didn't cut their bulb service life rating to do it. The double filament bulb means we'll always have working light to finish the shift. Each filament of the Edison Model S krypton-gas-filled bulb has a 400-hour designed life.

Just watch the improvement in our safety and tonnage reports. More light. Less weight. Longer life. Even the battery's better. It has a new active material that boosts service life. They went all-out to meet the miner's needs with this one.



reduced from 5c per ton to 2c. The program was designed and set up by men within the company. Results of this program prove that small- and medium-sized operations can design effective PM programs without spending large sums of money.

Maintenance Aids—Complete set of record and report forms accompanying this article will help you set up your own record system.

Modern Epoxy Insulation

Improves Motor Life p 109

W. Schneider, Manager, Repair Engineering, Westinghouse Electric Corp.

New insulating material and the use of epoxy resin can increase motor life. The mining industry can profit by using these new insulation systems which give super protection against humidity, oil, chemicals, abrasives and other contaminants. Much research has been directed to the development of these improved systems. What they are, how they are applied and the benefits they provide are discussed in this article.

D. C. McGRAW Jr., Publisher IVAN A. GIVEN, Editor

Harold Davis Managing Editor A. E. Flowers Associate Editor W. A. Raleigh Jr. Associate Editor

Daniel Jackson Jr. Associate Editor Richard J. Taft Assistant Editor F. A. Zimmerli Art Director

G. B. Bryant Jr. Washington

W. H. McNeal Circulation Manager

GORDON A. MACK, Advertising Sales Manager



Member of Associated Business Publications and Audit Bureau of Circulations

NEWS BUREAU OFFICES: Atlanta 3; Cleveland 15; Detroit 26; Houston 26; San Francisco 4; Washington 4.
WORLD NEWS OFFICES: London, Paris, Bonn, Tokyo, Bombay, Rio de Janeiro, Mexico City.

COAL AGE, VOLUME 65

January, 1960, NUMBER 1

COAL AGE, with which are consolidated *The Colliery Engineer and Mines and Minerals*, is published monthly on the 1st by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948) Founder. PUBLICATION OFFICE, Third & Hunting Park Ave., Philadelphia 40, Pa. See box below for directions regarding subscriptions and change of address.

EXECUTIVE, EDITORIAL, CIRCULATION AND ADVERTISING OFFICES: 330 West 42d St., New York 36, N. Y. Donald C. McGraw, president; Joseph A. Gerardi, executive vice president; L. Keith Goodrich, vice president and treasurer; John J. Cook, secretary. Officers of the Publications Division: Nelson Bond, president; Harry L. Waddell, senior vice president; John R. Callahan, vice president and editorial director; Joseph H. Allen, vice president and director of advertising sales; A. R. Venezian, vice president and circulation coordinator.

Subscriptions are solicited only from executives, management, engineering, operating and supervisory officials associated with companies engaged in the mining and preparation of anthracite, bituminous and lignite coal. Position and company connection must be indicated on the subscription orders. Send to address shown in the box below.

U. S. and possessions and Canada, subscription rate for individual in the field of the publication \$3 per year, single copies \$1; elsewhere \$15 per year, payable in advance. Single copies \$2. Second-class mail postage paid at Philadelphia, Pa. Printed in the U. S. A. Title registered in U. S. Patent Office. © Copyrighted 1960 McGraw-Hill Publishing Co. All rights reserved. Our primary aim is to provide subscribers with a useful and valuable publication. Your comments and suggestions for improvement are encouraged and will be most welcome. The publisher, upon direct request from any subscriber to our New York office, agrees to refund the part of the subscription price applying to copies not yet mailed. COAL AGE articles are indexed by Engineering Index. Coal Age's own index is published annually in the December issue.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Fulfillment Manager COAL AGE, 330 West 42nd St., New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address and including postal zone number, if any (official post office request). If possible, enclose an address label from a recent issue of the magazine. Since copies are addressed one to two issues in advance, please allow one month for change to become effective.

This Month in Mining Practice

TPM IN 1960—Between 1957 and 1958 output per man per day jumped from 10.59 tons to 11.33 in bituminous, and from 4.18 to 4.36 in anthracite. Equally large gains probably were marked up in 1959, which would bring bituminous to over 12 and anthracite to over 4.50 tpm. In 1960? Rising demand and production historically has been accompanied by an easing in the pressure to cut cost by raising efficiency, but the easing is only that and not a cessation in progress. In addition, industry habit is hard to break. Look, therefore, for a further increase of at least 1/2 tpm in bituminous and 1/10 to 1/5 in anthracite this year.

TIRES FROM PLANES—Will the aircraft industry, which already has provided the disk-type brake for shuttle cars, contribute its tires to the stripping cause? One leading producer has attained good results from replacing a standard tire on trailers with a smaller airplane tire. A considerable reduction in cost was possible in this instance with good prospects that life will be about the same. Not every situation could be counted as favorable, but there may be some particularly with some of the older and smaller trailer units.

And on the Shooting Front—A special pump developed for the purpose is showing real benefits in dewatering vertical holes prior to loading.

BOLTING INDICATOR—The continuing campaign to produce a reliable on-the-job indicator of roof-bolt tension has now resulted in the helical coil-spring unit now undergoing extensive field tests. Encouraging results are reported. Progress also is being made on other fronts, including study to develop better and more economical bolting patterns, and additional equipment for licking the dust problem, including new "through-the-steel" equipment that is showing its metal in initial installations.

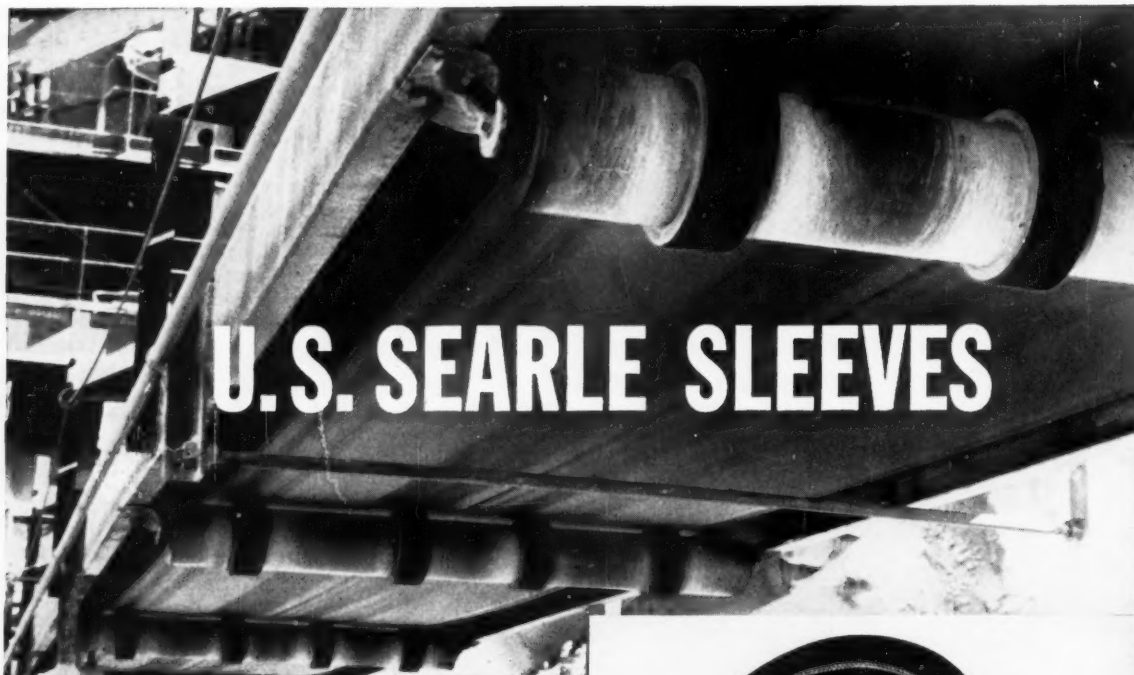
TESTING THE TESTS—Quietly but surely aptitude and personality testing of both supervisors and mine employees, either prospective or already on the job, is spreading in coal. This is happening because such testing works, though there is strong feeling that procedure and approach could be improved upon. For that reason, coal may be on the verge of moving out of the stage of getting testing established and into the stage of wider use coupled with refinement of testing methods and procedure. "Testing the tests" undoubtedly will make for better results not only in testing itself but on the job afterward.

GAS HANDLING—1960 should be a year substantial progress in taking care of methane at the face and elsewhere, particularly at the high rates sometimes encountered in continuous mining. One reason for anticipating this are the favorable results from new methods of attacking the gas problem, ranging from the diffuser-exhauster combination up to advance bleeding by boreholes ahead of the faces underground or down from the surface. Study of the problem also is providing concrete information on such things as brattice-cloth leakage, and formulas for forecasting tubing capacity.



SEARLE SLEEVES

The patented proven way to prolong conveyor belt life!



The patented Searle Sleeves are made of abrasion-resistant cushion rubber reinforced by heavy belt duck. Installation is fast, just slip them over the idler rolls. At impact points, cementing is recommended.

The build-up of wet muck in coal mining and fines and dust in metal mining are minimized or completely prevented on belts when idlers are equipped with U.S. Searle Sleeves. These Sleeves protect idler rolls from impact damage at transfer points. Keeping idlers clean and free from build-up eliminates constant servicing, and at the same time insures longer belt life. Belt "wandering" is eliminated and edgewear greatly reduced on both belt and idlers.

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.



Close-up of U. S. Searle Sleeve. Available in large variety of sizes to fit conventional conveyor idlers.



Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y.

In Canada: Dominion Rubber Company, Ltd.

The Coal Commentator

Enrol, Bear Down!

In October, 1959, there were 13 fatalities underground at bituminous mines. By causes they were: falls of roof, 10; haulage, 3. For the period January-October, falls of roof accounted for 107 of the 178 underground fatalities. Other falls were responsible for six fatalities.

These, or practically any other figures that might be compiled, point up the continued urgency of the roof-fall problem. If such accidents could be cut only in half coal's safety picture would be radically improved. If more could be accomplished coal then could say, more truthfully than in all its history, that it was really coming to grips with its safety problem. The means of achieving this reduction—and doing it now—already exist. The 1960 campaign to cut roof-fall deaths provides an extra incentive if more than already exists is needed.

Urgent: Enrol your mine or mines now. Bear down on roof-fall prevention. The game is well worth the candle.

In the Cards

Why research in mining, preparation and other operating methods is well worth more push was the subject of a dissertation on the editorial page of the December issue of *Coal Age*. Now, your commentator is moved to take a first-of-the-year crack at it as a result of perusing the Fall 1959 issue of *Bituminous Coal Research*, which should be on the must list of all mining men. It included a description of the field trials of a new moisture-control system for heat dryers, thus paving the way to completely automatic operation. The system also has possibilities for measuring coal moisture on belts, in chutes and at other points in the coal flow.

Automation need not be the sole objective in research into mining and preparation techniques. Anywhere sizable sums of money are spent—for labor, power, materials, maintenance, etc., etc.—is a field inviting attention. To repeat, real savings can be attained without too much effort.

Monorail Supply

Haulage with conveyors has always been accompanied by the problem—sometimes thorny—of getting supplies into the working sections. Methods in the U.S. have ranged from the use of the conveyor itself, either reversed or as a track for a small wheeled carrier, through shuttle cars or special supply cars to parallel tracks laid particularly for handling materials and men. A new entry is a monorail suspended from the timber and carrying a box or platform on chains. In level openings, roller bear-

ings permit the carrier to be pushed easily by one man. For grades or manless tramming, powered head and tail ropes may be employed.

Developed in Germany and recently adopted by one mine in Great Britain, the system is said to have real promise under certain conditions and systems. Certainly it is something "new" under the sun in coal production.

And in Russia

Continuing the report on developments in foreign practice, the Moscow office of the McGraw-Hill World News system reports, on the basis of material appearing in *Pravda*, that Russia has lit off, electrically, its largest underground gasification project, in the Angrenski coal field of Uzbekistan. Annual gas yield is expected to be more than 70 billion cu ft, most of which will go to the Angrenskaya power station. The coal lies at a depth of nearly 400 ft, and reserves total some 50 million net tons. If the heat content of the gas approximates that usually obtained with air for combustion, the announced production rate would be equivalent to 300,000 to 400,000 tons per year.

Russia has long been researching underground gasification on a major scale, but until now has not translated results into many actual projects. The Angrenski development may mean a major expansion in gasification.

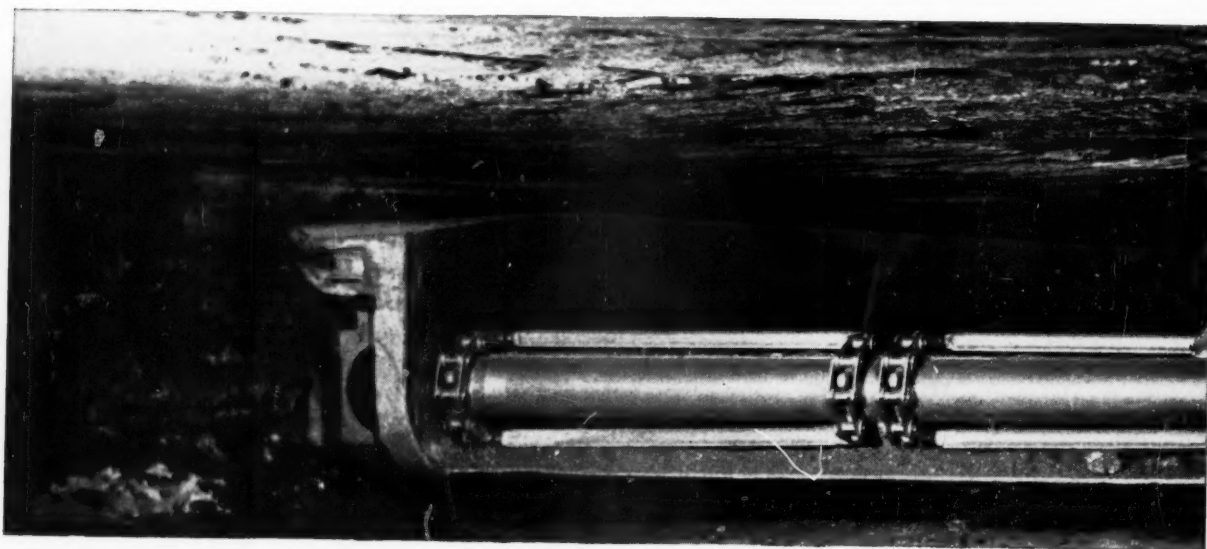
Not Soon

The Scott County (Tenn.) Miners' Union, an outgrowth of the growing spirit of rebellion in certain fields against the standard UMW contracts, may or may not become a power to be reckoned with in the coal picture in the future, even though it envisions a bigger role and consequently is planning to change its name to the "Southern Miners' Union." Its chances of major growth probably are not promising, but its existence and its expansion plans point up the problem that still exists for many commercial operators in the southern fields, as well as elsewhere, compounded of inherently higher costs growing out of less-favorable conditions and a steady increase in union demands. That the situation also poses a problem for the UMW is evidence by the almost continuous presence of Washington-office men in eastern Kentucky to try to win over holdouts and keep those already signed as happy as possible.

A higher production rate will ease the problem in this and other areas, but the basic difficulty will remain as long as wage rates are the same for several major competitive fields. Chances are, therefore, that the nonunion percentage will not be cut appreciably in the near future.

FROM JOY... A NEW TEAM FOR **LOW COAL**

a high capacity team
for seams as low as 30 inches



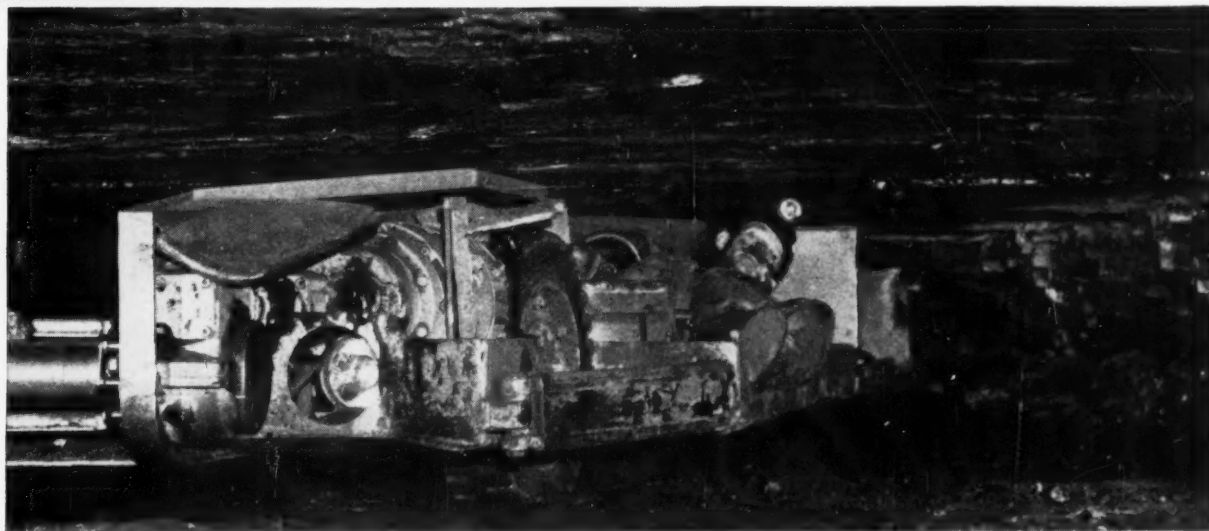
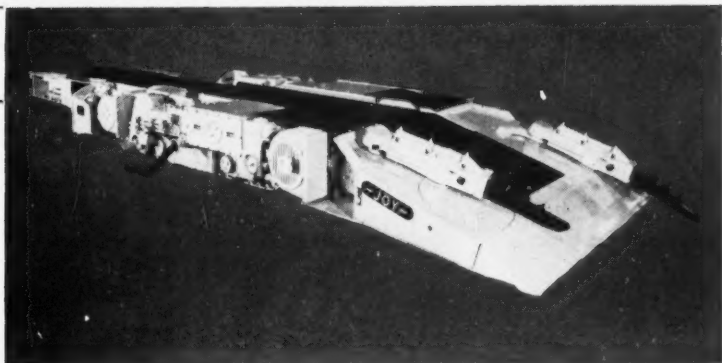
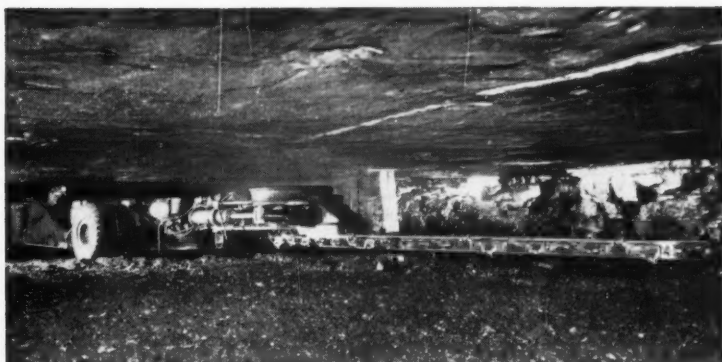
**WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING MACHINERY**

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company
(Canada) Limited, Galt, Ontario





AC

All Joy coal mining equipment
is available with AC or DC.

1 JOY 12-RB CUTTER

overall height: 26 inches

In mines where shear cutting is not practical, the 12-RB bottom cutter reduces initial investment. The cutter makes a cut over 30 feet wide without repositioning the machine. More time at the face is spent in cutting because there's no backing off and moving in again. Cutter bar tilt and roll make up for uneven roof or bad floor . . . can cut around faults or hard spots. Only 26" high to work seams as low as 30 inches. Bottom cuts from 9¾" below the floor to 21" above. Available in 220 or 440 volts, 60 cycle AC and 250 or 500 volts DC. Where top cutting is best another model, the 12-RT is available.

2 JOY 14-BU-10 LOADER

overall height: 24 inches

This newest loader was designed to incorporate many features of Joy's high-capacity, high-seam loaders. To cram more capacity into a 24" high loader, the 14-BU-10 has a wider head and a 30" wide conveyor. The gathering arms are faster and the conveyor moves at 360 feet per minute. Like larger Joy loaders, the machine is mechanically simple—no shifting clutches. All motors and parts requiring maintenance or inspection are mounted outside the frame for easy access.

3 JOY 18-SC SHUTTLE CAR

overall height: 27 inches

Only 27 inches high, the 18-SC hauls 4½ tons . . . twice the payload of any car of similar height. The secret is a unique 6-wheel design that adds two wheels at the center and reduces wheel sizes. The two center wheels provide traction, powered by separate 10 hp motors through a direct drive. There are no transmissions or torque converters to maintain.

The car is hinged to bend up and down in the middle. This permits it to follow rough bottom with rolls and dips. The absence of wheel wells gives the 18-SC a straight through conveyor 6 ft. wide and 27 ft. long . . . empties in 20 seconds.

LINATEX
LASTS LONGEST



**VALVES
CYCLONES**

**PUMPS
PIPING**

**Line
WITH
LINATEX**
(a specially processed rubber)
the most effective way
to combat abrasion

**CHUTES—LAUNDERS
HOPPERS—SKIPS
TABLE DECKS
CONVEYOR BELTS**

Write for free information

LINATEX CORP. OF AMERICA
P.O. DRAWER "D", STAFFORD SPRINGS, CONN.

CF&I-WICKWIRE
DOUBLE GRAY
HAS 15% GREATER BREAKING STRENGTH



... 15% greater than the catalog breaking strength of any improved plow steel rope with IWRC. That's because Double Gray is made with extra-improved plow steel that can better resist crushing and deforming on drums and sheaves of heavy mining equipment.

In addition to Double Gray, Wickwire makes all sizes and types of mining ropes, plus a complete line of slings and fittings. For complete details, ask for Wickwire's Mining Rope Folder. You'll find the nearest CF&I office listed in your phone directory. 7459

OFFICES LOCATED IN KEY CITIES EVERYWHERE

WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION

Wickwire Spencer Steel Division: New York, N. Y.

Pacific Coast Division: Oakland, California

The Colorado Fuel and Iron Corporation: Denver, Colorado




"ALL THIS FELLOW NEEDS IS A GOOD DOSE OF KELLY REPAIR PARTS"

KELLY MANUFACTURING CO.

MACHINE PARTS DIVISION CHARLESTON 21, W. VA.  STEEL FABRICATING DIVISION MIDDLEPORT, OHIO

**WHAT YOU DON'T
KNOW HURTS!**

Most key mining officials
read COAL AGE because it
helps them do a better job.

*If you're not a regular subscriber,
Mail this coupon TODAY*

COAL AGE, Fulfillment Manager,

330 West 42nd St., New York 36, N. Y.

Send me COAL AGE for 1 year at \$3 (U.S. and Canada only).

☐ Check enclosed ☐ Bill Company ☐ Bill me

Name Position

Mailing Address: ☐ Home ☐ Business

City Zone State

Mining Company

Hqds. or Mine Name CA551

To Save Delay, Please Fill Out Completely

coming and going

every
you take your profits on ~~the~~ run

with the *Lee-Norse*

BUS & JITNEY



Lee-Norse

MINE PORTAL BUS

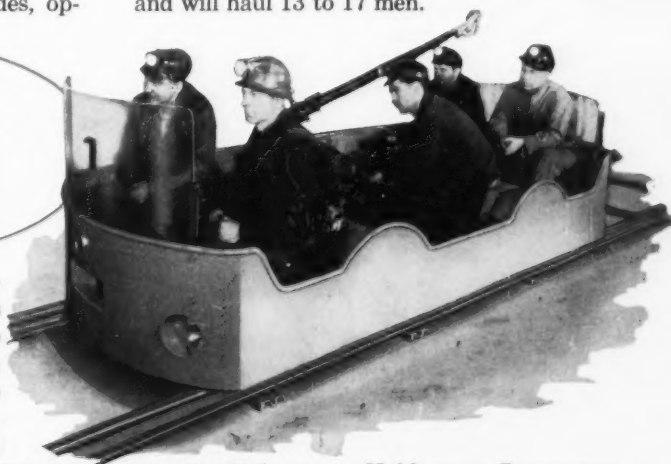
■ There's no wasted motion with this self-propelled Portal Bus because it is fast on the take-off, saving manpower time for conversion into more tonnage. And it is designed for safety, with hydraulic operated running brakes plus mechanical emergency and parking brakes direct on the wheels. For severe grades, op-

tional electric dynamic system produces braking effect from the motor for *extra* safety under all conditions. Also the split roof construction gives operator unimpeded, all directional view, while the trolley pole is always within quick reach. This bus is powered by 15 H.P. motor and will haul 13 to 17 men.

Lee-Norse

MINE JITNEY

■ The Mine Jitney is the "Jack-of-all-Trades" of the mine fleet because its versatility enables it to be used on the regular job and for emergency. It can handle the job of furnishing fast, safe transportation of key personnel, maintenance crews and special groups; and can double up as an ambulance or fire-fighting equipment car. Designed with twin braking systems for added safety. Powered with either



5 or 7½ H.P. motor. Holds up to 7 men comfortably. Optional equipment: Plexiglas windshield, fire extinguisher, stretcher equipment.

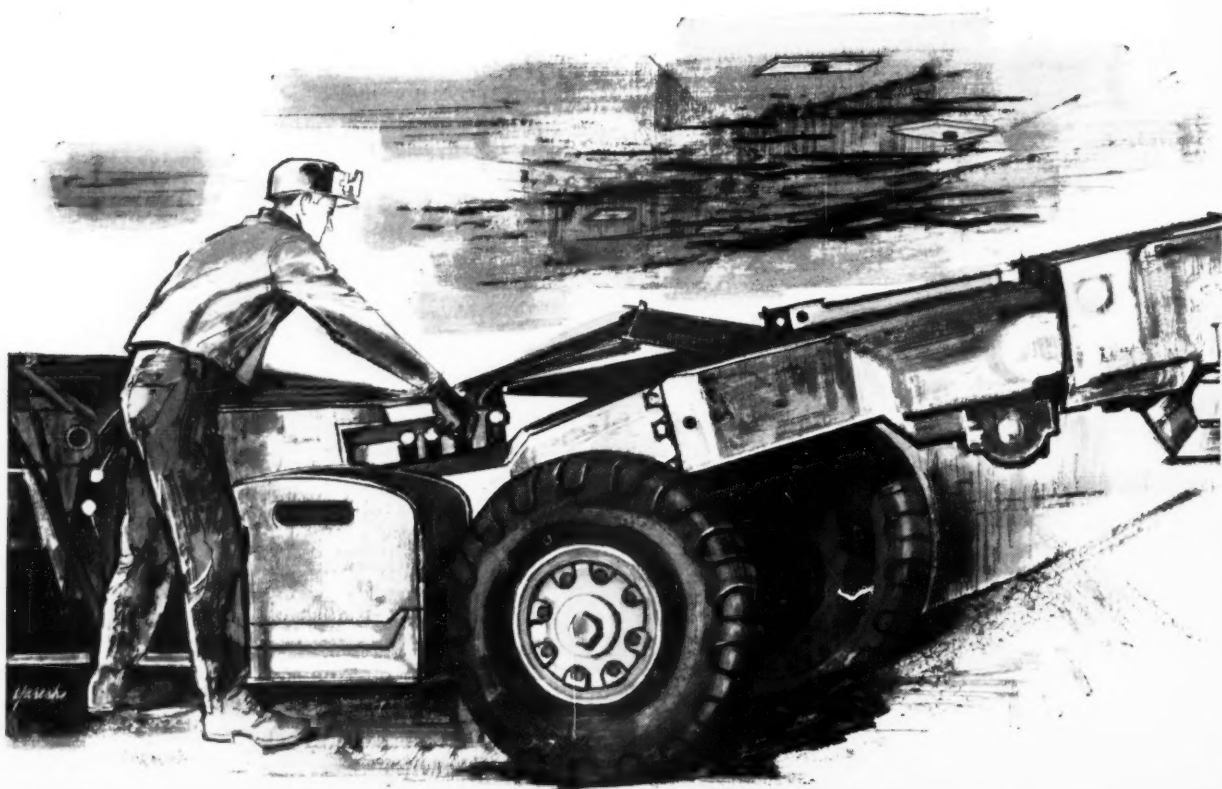


Lee-Norse Company

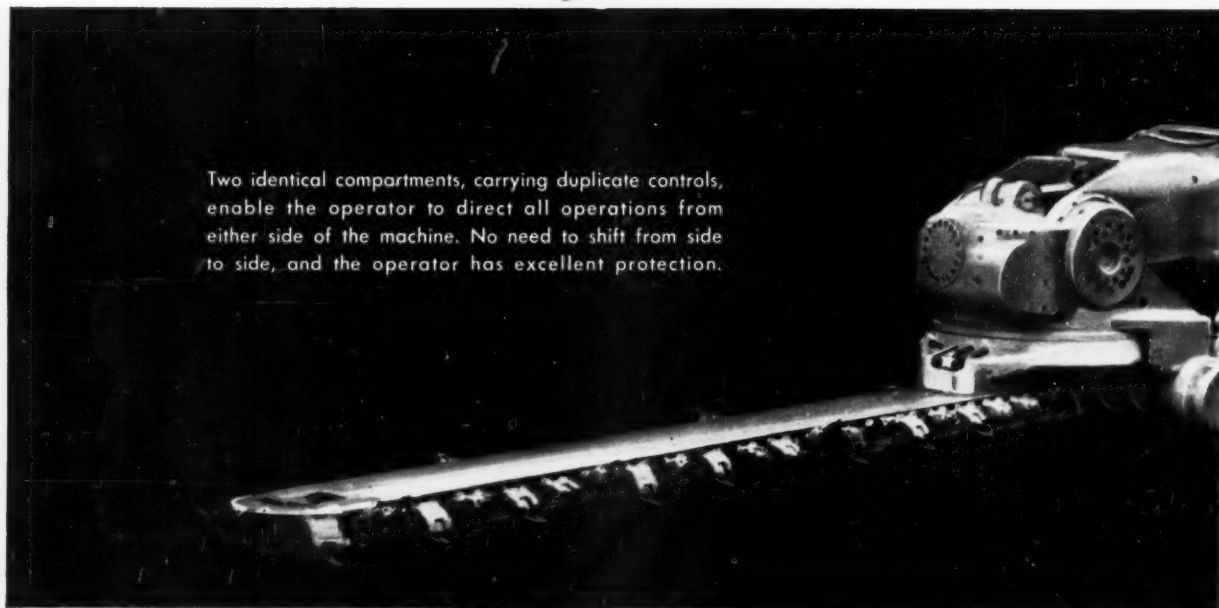
CHARLEROI, PENNSYLVANIA

SPECIALISTS IN COAL MINING EQUIPMENT

JEFFREY UNIVERSAL COAL CUTTERS . . .



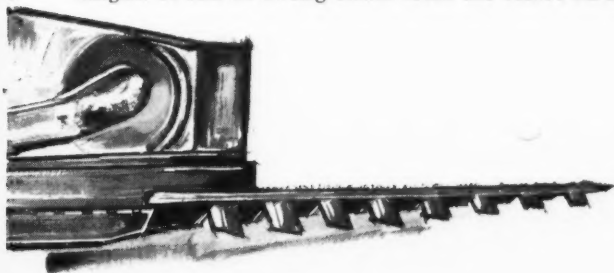
Two identical compartments, carrying duplicate controls, enable the operator to direct all operations from either side of the machine. No need to shift from side to side, and the operator has excellent protection.



cut any place in the seam from 14" below floor level to 13' above

Jeffrey Universal Coal Cutters (AC or DC) are designed to meet various mine conditions and are available for working in mines with seam heights ranging from three feet to thirteen feet.

Jeffrey cutting machines mounted on rubber tires have a cutting head which can rotate and is instantly adjustable in height. It can be swung either from the turret on a long radius



or from the cutter head on a shorter radius. This permits bottom or top cutting any place in the seam or for making a shear cut right or left of center.

These machines feature the latest developments in coal cutting efficiency to give more workability without breakdowns... important advantages in getting higher production.

ADVANTAGES

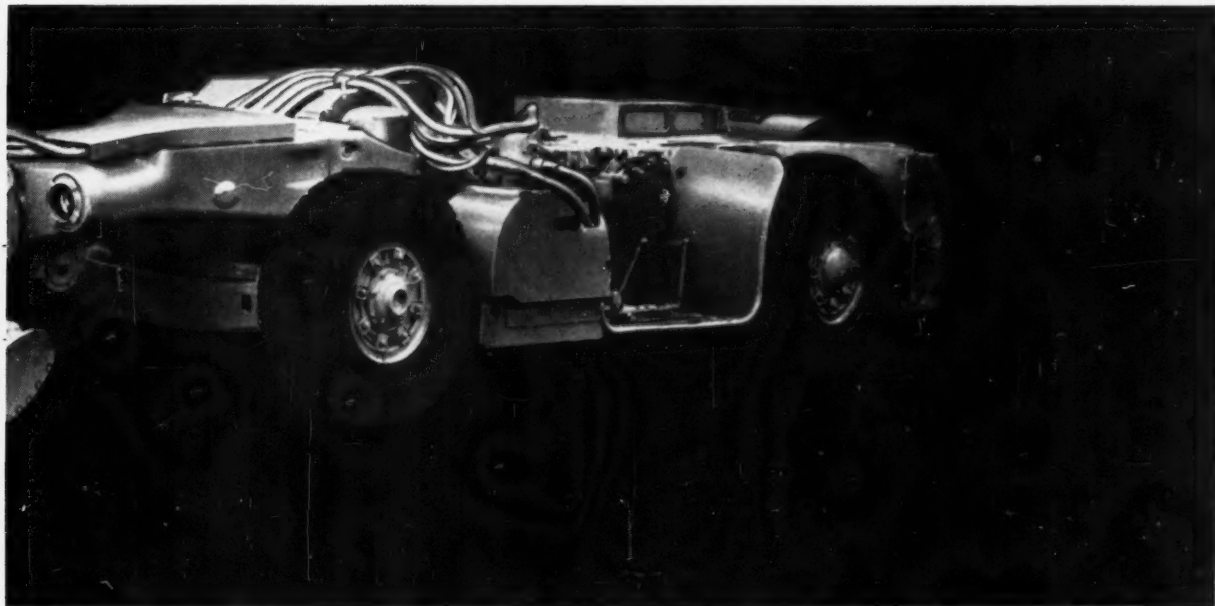
1. Full hydraulic control of all operations except cutter chain drive
2. Easy to operate and control — giving quick response from fingertip controls
3. Built for safety and speed
4. Designed for hard cutting
5. Constructed to stand up under rugged going
6. Have maximum flexibility and low cost operation — no operating time wasted
7. More smooth cuts per shift
8. Operating and control mechanisms are accessible for maintenance



JEFFREY

THE JEFFREY MANUFACTURING COMPANY
912 North Fourth Street
Columbus 16, Ohio

MINING • CONVEYING • PROCESSING EQUIPMENT... TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



UNION



The *UNIQUE Wire Rope Organization

**Single in Kind or Excellence*

Customers can be credited for Union's outstanding position.

Why? Simply because in large numbers they accepted Union's standing invitation to share their wire rope and sling problems with Union's technical, research and engineering staff.

In meeting these challenges, Union has compiled an outstanding record in wire rope advancements. Some 1600 standard wire rope constructions are in day-to-day production under statistical quality controls which insure "the ultimate low cost rope." This means quality so

good that it costs less in the long run.

In searching for better answers to wire rope and sling problems for customers, Union engineers developed the famous family of Tuffy wire ropes and slings.

Each member of the Tuffy family is of a special construction tailored to one of the tougher wire rope jobs. In the Tuffy constructions there is balance—the right combination of strength, flexibility and resistance to wear for better performance and greater safety. When you say Tuffy, you specify the "Ultimate low cost" wire rope or sling.



Tuffy® Wire Ropes and Slings



**Tuffy Balanced
Dragline Rope**



**Tuffy Balanced
Scraper Rope**



**Tuffy Balanced
Dozer Rope**





Big Paul, The King of Spades, world's largest electric power shovel. In taking a 105 ton bite (2 rail carloads) it imposes a maximum bail pull upon the wire ropes of 550,000 lbs. One-half mile of wire rope is required in its operation by the Peabody Coal Company at its modern River King Mine, Freeburg, Ill.



Tuffy Balanced Slings and Hoistlines



1-C



Look Up Your Union Distributor In Phone Book Yellow Pages

He's selected for his ability and willingness to supply you with the right Union standard or Tuffy wire rope construction, to check for proper installation and coach your operators in proper use to get the ultimate in service life. He is backed up by a nearby Union branch office and warehouse. If you would like to receive Union's Rope Dope Educational Bulletin, write Union Wire Rope Corporation, Manchester Ave., Kansas City 26, Mo.

UNION Wire Rope



Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

Tuffy Wire Rope Tips



on Safe Use of Wire Rope and Slings



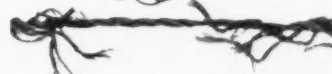
On the Blink from a Kink



Mishandling of rope caused this open kink. Avoid kinks by proper winding on the drum. Never pull a loop smaller. Enlarge it, then straighten out the rope.



Overloaded - Soon Exploded



The rated capacity of a wire rope is based on breaking strength divided by the load factor for particular type of service. Grade of steel, type of construction and size of rope determine tensile strength. Unless rope is properly related to loads, costly and dangerous early failures are likely to occur.

Mangled in a Wedge Socket



Here's a result of improper socketing, caused by poorly designed or worn-out wedge socket. Can be costly and hazardous!

Victim of the "Bends"



Excessive bending of rope speeds up wear. General rule: use more flexible ropes as bending stresses increase (with decrease in tread diameter of sheave or drum). If sheaves are too small, early rope failure is certain.

Would you like a copy of a booklet in which more than a score of Tuffy Tips like those above are reproduced. If so, write Union Wire Rope Corporation, 2130 Manchester Ave., Kansas City 26, Missouri.

The big advantages of Taper-Lock mounting are now available for practically all of your sprocket installations. Below is listed the new wide range of types and sizes offered by Dodge!

This important expansion of the Dodge line is the result of the enormous popularity of the Taper-Lock idea. Taper-Lock Sprockets are *modern*. Industry likes them because they go straight from shelf to shaft without

machining—saving time. They are “easy on—easy off”—saving work. Their bushings can be re-used, not only in replacement sprockets, but in sprockets of different sizes and also in Taper-Lock Sheaves, Couplings, Conveyor Pulleys. Taper-Lock saves inventory—and money!

Dodge Taper-Lock Sprockets and Dodge Roller Chain are available through your local Dodge Distributor. Call him. Or write us for bulletin.



No Reboring!
No Keyseating!
No Waiting!



of Mishawaka, Ind.



CALL THE TRANSMISSIONER — your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for “Dodge Transmissioner.”

● **DOUBLE PITCH CHAIN and SPROCKETS**

Transmission Series (No. 2040 to 2080) and Conveyor Series (No. 2040 to 2100). Sprockets to 112 teeth—including, for the first time, stock sprockets of 17, 19, 21, 23, 25 and 35 teeth *made especially for double pitch chain*. Introduced by Dodge, these sprockets are designed for even distribution of tooth engagement and absolute accuracy of mesh. Wear is reduced by half. Life of chain and sprocket is doubled!

● **PLATE SPROCKETS**

Steel Plate, Type A. No. 35 to 120. Mandrel bore, bored-to-size or Taper-Lock.

● **SINGLE STRAND CHAIN and SPROCKETS**

No. 35 to 160. Sprockets to 112 teeth.

● **DOUBLE STRAND CHAIN and SPROCKETS**

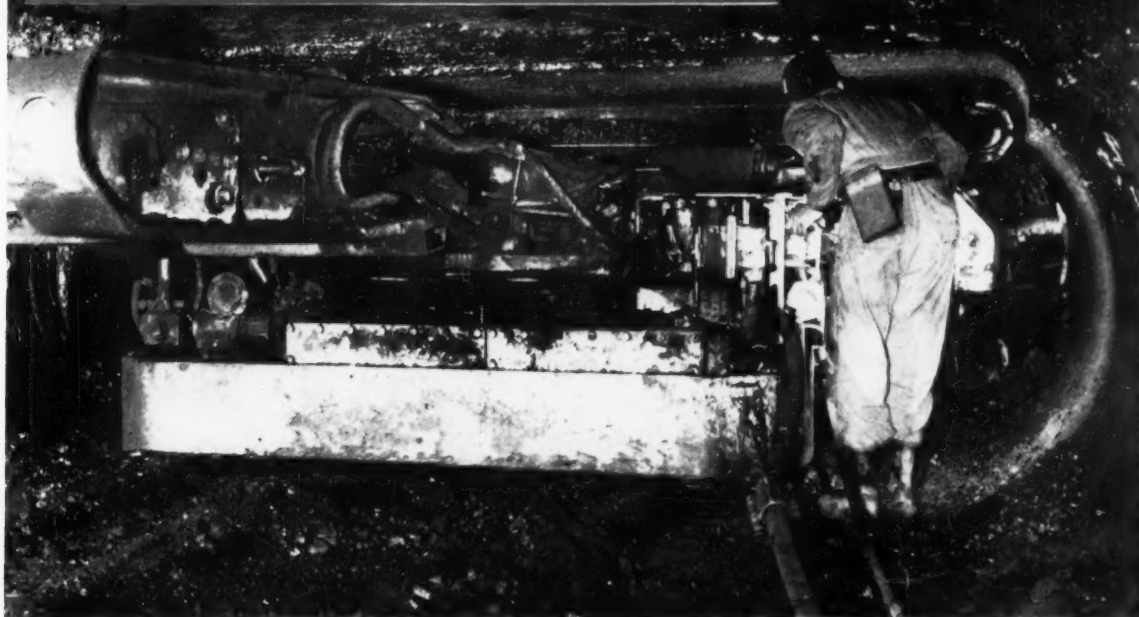
No. 35-2 to 80-2. Sprockets to 112 teeth.

● **STANDARD ATTACHMENTS**

ALL TO ASA STANDARDS

DODGE MANUFACTURING CORPORATION, 3000 Union Street, Mishawaka, Indiana

The **GOODMAN** Performance Report



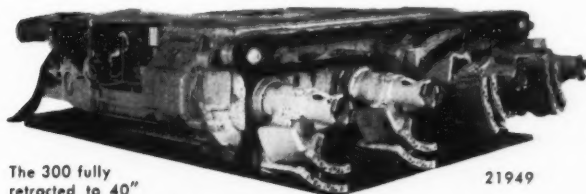
22504

How to make money in 48" to 66" coal

The money making answer is the Goodman Type 300 Continuous Borer. It has the maneuverability needed for development or pillar recovery work, and the cutting height can be varied while operating. Also, fewer working faces are needed to produce high tonnages, supervision is closer and section maintenance is lower. Advance into the coal is rapid and continuous thus reducing the possibility of roof deterioration.

Money making advantages of the "300"

- Variable cutting height, while in operation, from 48" to 66".
- Consistent high productive capacity to match highest speed take-away system.
- A full face, one pass machine cutting a 13' 10" wide path at 48" height and a 14' 10" path at 66" (two passes, of course, can be made).



The 300 fully retracted to 40" height for safe tramming.

21949

- Cuts and loads high percentage of coarse coal to suit your market and to cut mechanical cleaning costs—bits contact only small area of face, conveyor throat accepts lumps.
- Full hydraulic control of all movements including a variable mining feed.
- Arched sides of path cut provide roof support, there is ample room for the operator at any cutting height, bottom is wide and flat for good roadway.
- One 250 hp AC or DC, totally enclosed, fan cooled, USBM explosion proof motor powers all functions.
- Large rugged parts; good accessibility for inspection and repair.

Let us arrange to show you a 300 in action.

GOODMAN

MANUFACTURING COMPANY

Halsted Street and 48th Place, Chicago 9, Illinois

CUTTING MACHINES • CONVEYORS • LOADERS
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

Use Genuine Goodman Replacement Parts



"I call Bethlehem when I need track spikes fast. They carry all standard sizes in stock, ready to go at a moment's notice."

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



*ENEMY OF WEAR,
DOWN TIME AND WASTE
AT BUCKHORN MINE*



Processing plant of Bell & Zoller's Buckhorn Mine, Johnston City, Illinois uses STANOLITH Grease MP.

STANOLITH GREASE MP



Situation: As with every underground mine, equipment at Buckhorn Mine is susceptible to wear unless moving parts are protected with a grease film that stays in place regardless of heat, water or dirt.

What was done: Buckhorn Mine management knew where to turn for assistance on lubrication and experienced advice on how to protect equipment from wear. They called on Standard Oil mine lubrication specialist Hervie Dillingham. Hervie recommended STANOLITH Grease MP. This lithium grease is particularly suited to mine lubrication jobs because of its (1) ability to shield parts from grit and dirt, (2) resistance to both high and low temperatures and (3) resistance to water wash out. STANOLITH Grease MP holds its consistency even under the severe working conditions encountered in the lubrication of mine equipment. With its ability to provide lubrication over a wide range of applications, fewer greases need to be inventoried. One drum of grease instead of many different ones reduces costs, saves handling on the job, eliminates application mistakes.

What you can do: Let a Standard Oil lubrication specialist help you find ways to eliminate your lubrication problems. One of these men is on the staff of each of the 48 district offices in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

*Quick facts about
STANOLITH Grease MP*

- Capable of providing superior lubrication over a wide range of applications
- Water resistant
- High temperature resistant
- Pumpable in grease gun or pressure system
- Mechanically stable



You've got to get down there to see the problem. Standard's Hervie Dillingham does just that. Hervie has experience and training to know what's needed. He has been providing technical service to mines for more than 20 years.

YOU EXPECT MORE FROM



AND YOU GET IT!

HAVE YOU SEEN

HOW the new
AIRDOX
Mobile Multiple
Shooting System
Operates

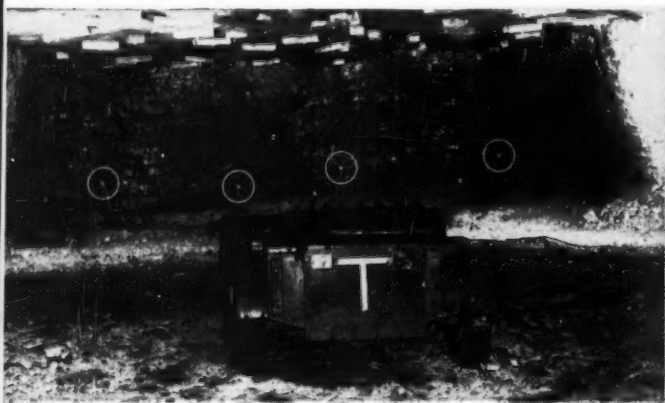


the NEW,
HIGH PRODUCTION
AIRDOX
M^{OBILE}**M**^{ULTIPLE}**S**^{HOOTING}

NON-EXPLOSIVE MINING SYSTEM



1/ Shooter drives the AIRDOX Shooting Car to the face. All AIRDOX Tubes, High Pressure Hose and Sequence Valve are carried on the car, which may be operated under roofs as low as 30".



2/ AIRDOX Tubes are placed in holes. Note four tubes in lower row of holes in face, with other rows of holes above.



3/ With AIRDOX Tubes in place and high pressure hose connected, shooter discharges first row in correct sequence, with single operation of AIRDOX Blow-Down Valve.

SEE THE NEWEST AND LATEST
AIRDOX CARDOX
PRODUCTION BOOSTERS

New AIRDOX Shooting Car
Used in the new AIRDOX Mobile Multiple Shooting System. Self-propelled, especially designed for mine use. Transports AIRDOX Tubes, high pressure hose, Sequence Valve, etc.

New AIRDOX Lightweight Tubes
Weigh only 27 pounds — easier and faster to handle.

New AIRDOX Automatic Discharge Heads
Operate at predetermined pressure

over and over, without replacing shear strips.

New AIRDOX Sequence Valves
Now permit multiple shooting, with resulting savings in time and higher tonnage.

Also a complete line of CARDOX heat treated alloy steel augers, carbide tipped bits, all designed to give you lower cost per foot cut or drilled . . . Plus many others.

For any mine now using AIRDOX, this new Mobile Multiple Shooting System will substantially cut costs. For mines not yet using AIRDOX, it offers one more compelling reason for immediate investigation of AIRDOX savings...in easier loading and cleaning, greater safety, better rib and roof protection. Relatively small expenditure is involved. See how it works.

The shooter drives to the face in the new self-propelled AIRDOX Shooting Car. He places the AIRDOX Tubes in the lower row of holes and shoots them in proper sequence and in a single operation, in accordance with accepted safety standards. He moves the Tubes to the rows above and repeats until the entire face has been broken down.

Because the new lightweight AIRDOX Tubes also have *automatic discharge heads*, they can be used over and over again without the necessity of replacing disks, nails, shear strips, etc. Dead work is turned into productive time and higher tonnage.

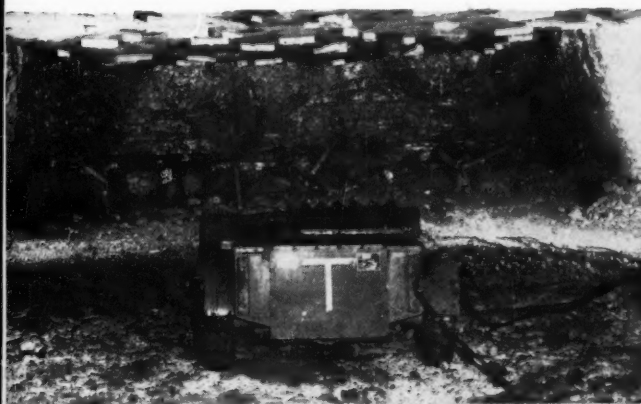
Each tube discharges at a pre-determined pressure. Sequence and high-speed shooting is controlled by an automatic Sequence Valve on the AIRDOX Car, which also carries the Tubes and high pressure hose to the face.

The AIRDOX Mobile Multiple Shooting System is a carefully researched and field-tested means to reduce face preparation time and costs. It retains all of the established AIRDOX advantages, may be used in seams of any thickness and offers particular advantages in thin seam operations.

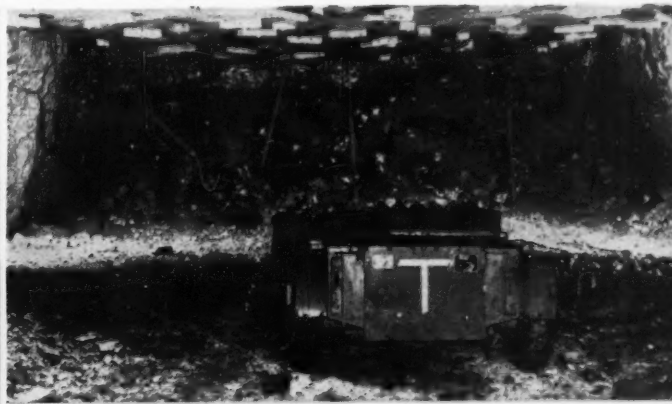
Your AIRDOX Engineer has details and operating savings realized by the AIRDOX Mobile Multiple Shooting System. Ask him for a full scale demonstration in your mine. Let the facts speak for themselves.

Write or phone today. This may be one of your most profitable steps in 1960!

Automatic, quick-sequence shooting of 4, 5 or more holes at a time reduces face preparation time and costs



4/ Second row of holes is then shot. Note that Tubes are still in face. Automatic discharge heads in new AIRDOX Tubes enable Tubes to be reused without removing or replacing shear strips.



5/ Here, the final row of holes has been shot. Note that coal rolls forward for easy loading. The shooter has made only one fourth as many trips to the face as formerly required.

*You'll be seeing more and more
new products and advances from*

AIRDOX

AIRDOX COMPANY 307 N. MICHIGAN AVENUE, CHICAGO 1, ILLINOIS
DIVISION OF MARMON HERRINGTON COMPANY, INC.

WAREHOUSES and DISTRICT OFFICES

Harper, West Virginia Phone: Beckley CLifford 3-4812	Benton, Illinois Box 537 Phone: Benton 8-3821	Findleyville, Pa. R. D. No. 2, Box 571 Phone: Dickens 8-7143	Pikeville, Kentucky Route 2, Box 571 Phone: Robinson Creek No. 5	Evansville, Indiana 307 N.W. 5th Street Box 84 Phone: Harrison 2-8944
St. Clairsville, Ohio Box No. 1 Phone: St. Clairsville 619	Louisville, Colorado Phone: Boulder Hillcrest 2-7298	Ottumwa, Iowa Phone: Ottumwa Murray 4-6564	Camden-on-Gauley, West Virginia Phone: Camden-on-Gauley 2181	

AIRDOX PRODUCTS ... Airbox and Cardox Non-Explosive Mining Methods ... Complete Line of Carbide Tools ... Augers, All Sizes ... Auger Miners ... Rotary Drills ... Underground Mobile Equipment ... Roof Bolting Machinery ... Hydraulic Drills ... Cardox Central Compression Systems for Air, Helium and Other Gases.

News Roundup

Car Shortage Crimps Output

Coal men worry that freight problem will grow into a crippling squeeze in spring when construction industry transport needs soar.

A SEVERE SHORTAGE of hopper cars is crimping coal production. "It has caused about a dozen shutdowns in our mines in West Virginia . . .," reported Walter F. Schulten, vice president of Consolidation Coal Co.

The coming months do not look much brighter. Shippers are fearful of a worse car shortage in the spring because the current pinch comes at a time when cars normally are plentiful, the bulk of 1959's farm crops having already moved to market.

Key problem seems to be a dwindling of the nation's serviceable rail freight cars, now down to just over 1,550,000 cars, near an 18-yr low. Even railroad presidents, who might be expected to pass off the car shortage lightly, admit the seriousness of the problem.

"A hell of a shortage of hopper cars is developing," says A. J. Greenough, president of the Pennsylvania R.R. "Things are nip and tuck right now," agrees Wayne A. Johnston, president of the Illinois Central, which hauls Kentucky and Illinois coal to utility plants in the Chicago area.

No Stockpiling—So at a time when steel mills and utilities would be expected to be rebuilding depleted stocks of coal, coal shipments are below par. Joseph T. Berta, president of Pittston Clinchfield Coal Sales Corp., reported that "in November three of our mines served by the Baltimore & Ohio R. R. in West Virginia shipped some 75,000 fewer tons of soft coal than would have been the case if we had been given enough cars." In recent weeks production at the three mines was cut back to only three days a week because of the car shortage.

"We're running into acute car shortages at all our captive coal mines," says Bethlehem Steel's Mr. Cooper. "Some days we don't receive any cars at certain mines after ordering as many as 120."

The Weather — Worrying about weather conditions is Ralph C. Kintz, traffic manager of Peabody Coal Co. He is fearful that the hopper car shortage may take a turn for the worse in coming

weeks. When the Great Lakes are closed with ice, he contends, iron ore normally shipped by freighter from the northern iron ore ranges will have to be hauled down to steel mills by rail.

The railroads are trying to get steel now to make repairs on laid-up cars. But even repaired cars plus new ones may not be enough, because with the approach of spring this year revival of activity in the construction industry will create a need for thousands of hopper cars every day.

NCA Looks Ahead

F. Stillman Elfred, chairman of the board of the National Coal Association, said recently at the annual dinner meeting of the Northern West Virginia Coal Association, that with the NCA reorganization "we will give you within two years an organization comparable to the very best possible, an organization that will more than prove its worth to you."

Mr. Elfred, who is also chairman of the board of Peabody Coal Co., continued:

"The objective of the reorganized NCA is not materially different from the objectives of the Association, so many years past. It is to improve the coal industry by serving them with information and statistics, and to be of

assistance to the entire industry in legislative matters, safety matters, public relations . . . The real value of the new NCA will be that one organization will be representing all the major facets of our industry."

Mr. Elfred said that in the new president of the National Coal Association, Stephen F. Dunn, the NCA executive committee has found a man to meet its qualifications of executive ability, experience, vision, imagination and willingness to work. Mr. Dunn has resigned as vice president in charge of government relations of the National Association of Manufacturers to accept the National Coal Association presidency.

Mr. Elfred urged coal men to take more part in civic, state and national affairs. He said not only public officials but the electorate should be informed of the problems affecting the coal industry, such as residual oil imports and dump sales of natural gas.

"We can object strenuously and fight with all efforts any attempts to displace coal by natural gas in the markets that are rightfully and economically coal's province, particularly when such intrusion is made competitively possible through below-cost sales," Mr. Elfred said. He called on coal men to educate the public as to the importance of an effective and realistic national fuels policy "so that when our country is confronted with a national emergency, our fuels industry will not be found wanting."

Stored Power

Union Electric Co. has announced plans for a \$50 million installation to "store" power by using steam-generated electricity to pump water uphill during the night and generating electricity from the same water running downhill during the day.

Called a "pumped storage" project, the construction will be near Lesterville, Mo., and is expected to provide an additional 350,000 kw of daytime peak capacity by the time of its completion in the spring of 1963.

Reported to be larger than two similar projects at Niagara Falls and in Great Britain, the storage arrangement involves construction of two small pools, one at the top of a 1,000-ft high granite mountain, and the other near the east fork of the Black River at Taum Sauk Creek.

Idle steam power will be used to pump the water uphill during the night

In This Section

People in Coal	p 38
Current Coal Patents	p 44
Equipment Approvals	p 46
Preparation Facilities	p 48
Coal Abroad	p 52
Mines and Companies	p 56
Utilization	p 57
New Books	p 60
Coming Meetings	p 60

EFFICIENT...



SAFE...



STRONG...



VERSATILE...



PROVEN...



WILLISON COUPLERS

The Willison has only four moving parts.

WILLISON COUPLERS

No need for men to go between cars to couple or uncouple.

WILLISON COUPLERS

Coupler head and shank are one-piece steel casting with over 400,000 pound ultimate strength.

WILLISON COUPLERS

Used on all types of mine cars and locomotives; with accessories, can couple with link-and-pin hitchings; can be used with cables on incline haulage or odd pulling requirements.

WILLISON COUPLERS

Over 100,000 Willisons in service in the U. S. and overseas.

- Rubber Cushioned Units
- Mine and Industrial Car Trucks
- NACO Steel Wheels
- NACO Steel Links and Swivel Hitchings

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Established 1868

*Transportation Products Division
Cleveland 6, Ohio*

*International Division Headquarters
Cleveland 6, Ohio*

*Canadian Subsidiary
National Malleable & Steel Castings
Company of Canada, Ltd., Toronto 1, Ontario*

News Roundup (Continued)

when most industrial and commercial customers are shut down. Economies resulting from the project are expected to be substantial.

More Coke Capacity

Bethlehem Steel Co. will add 76 coke ovens at its plant in Lackawanna, N. Y. Cost of the project is estimated at about \$7,500,000.

Arthur B. Homer, Bethlehem president, said the new coke ovens were needed to meet the plant's increasing requirements for blast furnace fuel. When the project is complete, the plant will have 535 coke ovens. The 76 new ovens will add 500,000 tons a year to the Lackawanna plant's coke-making capacity, lifting total output to 3 million tons a year.

Bethlehem also plans to expand its coal-storage yard, building new coal and coke conveyors to service the 76-oven battery, and putting up additions to expand a coke by-product plant.

New Power Plant

American Electric Power System has selected a 480-acre site on the southeastern shore of Lake Michigan as the location of another major power plant.

Philip Sporn, AEP president, emphasized that the new plant, which will be about 9 mi south of St. Joseph, Mich., will play an important part in the future

growth of the territory served by the big utility.

He pointed out that the continuing growth and development of southwestern Michigan and northern Indiana, the region AEP's subsidiary, Indiana & Michigan Electric Co., serves, dictated that immediate steps be taken to insure that the area's electric power supply be both available and plentiful in advance of the requirements of progress.

Mr. Sporn said the type of fuel to be used in the power plant has not yet been determined, pointing out that either coal or oil could be used, and in the future, possibly some type of atomic fuel.

Research Grant

One of the first National Science Foundation grants for research in mining engineering has been awarded to The Pennsylvania State University.

Dr. Howard L. Hartman, professor and head of the Mining Dept., is the recipient of a three-year, \$32,600 grant to study the mechanics of brittle fracture in rock under impact loading.

The purpose of the research, being conducted in Penn State's Rock Mechanics Laboratory, is to discover the mode and sequence of rock failure under an impact blow, such as employed in percussion drilling. Although rock drills have been used in mining for almost a hundred years, their basic ac-

tion in penetrating rock in the drill hole is not well understood. Admittedly an inefficient process, probably of the order of 1 to 2%, improvements in rate of penetration and bit life depend upon increasing the knowledge of the basic cutting action.

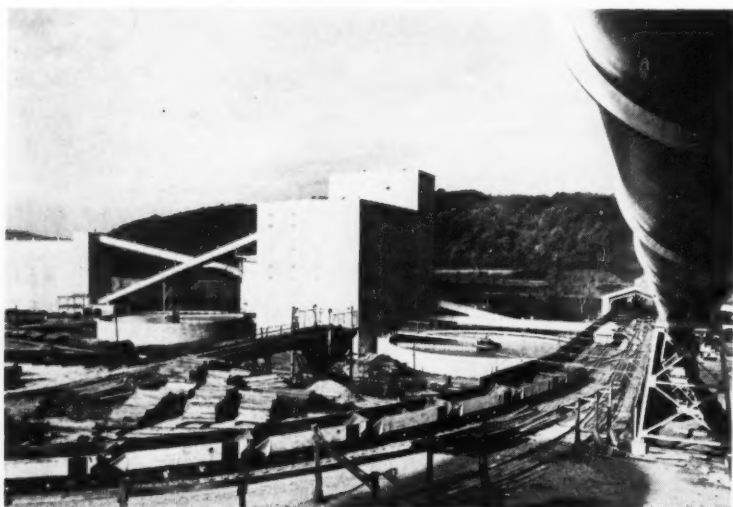
Research will be conducted in two phases. The first will study the mechanism of brittle fracture in rock under single-impact blows. Synthetic and natural stone will be employed with suitable stress instrumentation and high-speed movie photography to record the sequence of failure. The final phase will involve research on the behavior of rock under multiple blows, from low to very high frequencies, an especially promising field.

Maumee Bought

Two Peabody Coal Co. subsidiaries, Alva Coal Corp. and Sentry Royalty Co., have purchased for cash the four mining properties of Maumee Collieries Co., of Terre Haute, Ind.

The companies did not disclose what price they paid for Maumee, which has estimated annual production of 1,650,000 tons. Maumee mines are in freight rate districts in which Peabody Coal has no mines and Maumee coals have different analytical characteristics from those coals Peabody now produces at its other properties.

(Continued on p 30)



NEW PREPARATION PLANT at United States Steel Corp.'s Maple Creek mine, Washington County, Pa., has begun operation. The facility, said to be one of the most modern in the world, will be able to wash 800 tph of coal at peak operation. Processed coal from the new Maple Creek mine and four other U. S. Steel mines will be taken to the firm's Clairton Works for conversion into coke for Pittsburgh district blast furnaces.

COAL AGE

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 COLLIERY ENGINEER, with which MINES AND MINERALS previously had been consolidated, was absorbed by COAL AGE.

In 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., Inc. COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During 48 years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Leshner, John M. Carmody, Sydney A. Hale and Ivan A. Given. The editorial staff of COAL AGE presently consists of Ivan A. Given, Harold Davis, A. E. Flowers, W. A. Raleigh Jr., Daniel Jackson Jr. and R. J. Taft.

PROX *NEW* PT-2 TAPERED SHANK BIT

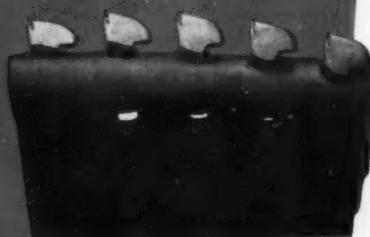
IS SUPERIOR TO ALL OTHER BITS!



Individual head for boring type miner—can be adapted to other types. Installed in any combination of angles desired.

NO MORE DOWN-TIME DUE TO SET SCREWS OR SHANK FAILURE

A BETTER BIT FOR YOUR CONTINUOUS MINER



Typical installation on multiple holder for boring type miner.

PROX

FRANK PROX COMPANY, INC. • TERRE HAUTE, INDIANA

Consult your nearest PROX SALES REPRESENTATIVE for complete information:

TRI-STATE MINE
SUPPLY
P.O. Box 1790
Uniontown, Pa.

WARREN HAWKINS
1201 S. 1st St.
Terre Haute, Indiana
Crawford 4341

RICHARD M. WILSON
27 Oak Park Drive
Wheeling, West Virginia
Woodsdale 586

SAM EVANOFF
Box 348
Carlsbad, N. M.
Tuxedo 5-3138

FRANK MEMMOTT
Box 154
Kenilworth, Utah

CHARLES J. FORBES
1201 S. 1st St.
Terre Haute, Indiana

MARSHALL EQUIPMENT CO.
P.O. Box 1367
Huntington 15, W. Va.

JOHN WILLIAMSON
309 W. Berkley St.
Uniontown, Pa.

Two years of successful field use proves this new PT-2 Bit America's number one for performance!

- 1 Eliminates need for roll pins, set screws, or rubber retainers. Results in less inventory and less maintenance.
- 2 Round shank exceeds three times the back-up area of the conventional bit. Results in less holder distortion and maintains positive bit angle.
- 3 Improved aligning device is incorporated for quicker, more accurate setting of bit.
- 4 Perfect matching between holder and bit eliminates vibration of bit and increases the life of the carbide.
- 5 Easily removed from top or bottom.



Coal Age Announces New Promotions

Daniel Jackson Jr., formerly assistant editor, has been named associate editor of *Coal Age*.

Mr. Jackson, who hails from Amherstdale, W. Va., is a former chief electrician of Winding Gulf Coals, Inc., Tams, W. Va., and joined the staff of *Coal Age* in December 1956. He attended the Dept. of Electrical Engineering, West Virginia University, College of Engineering.

Previous to his association with Winding Gulf Coals, he worked with the Guyan Eagle Coal Co. and was an electrical-mechanical inspector for Amherst Coal Co.

At *Coal Age*, Mr. Jackson recently inaugurated a special section called "Maintenance Ideas." He combines frequent mine visits, consistent personal contacts in the field and extensive editorial research with his 10 yr of practical electrical and mechanical maintenance experience in the production of this informative section.

Gordon A. Mack has been named to the position of advertising sales manager of three McGraw-Hill publications, *Coal Age*, *Engineering & Mining Journal* and *E&MJ Metal & Mineral Markets*.

Mr. Mack, whose appointment became effective Jan. 1, 1960, joined the New York staff of *Coal Age* in January, 1947, and was later transferred to the mining publications' sales staff in the Midwest area.

In 1950, he became associated with another company publication, *Construction Methods & Equipment*, later returning to the mining publications in 1953.

Recently, he has been a Western District manager for the mining papers, with operating headquarters located in Chicago.

Mr. Mack spent three years with the Army Corps of Engineers as a first lieutenant. He obtained his formal education at the University of Minnesota. Before coming to McGraw-Hill, Mr. Mack was with the Nash-Kelvinator Sales Corp.

Dry Coal Pipelining Vs Natural Gas

Recent discussion of a second and larger coal pipeline from western Pennsylvania and northern West Virginia to Philadelphia and New York has prompted Theodore Nagel, of Brooklyn, N. Y., an early proponent of dry pipelining (*Coal Age*, May, 1958, p 118), to supplement his notes on the possibilities of competing against natural gas in the October, 1958 issue of *Coal Age*, p 52.

The basis for dry pipelining of coal is reduction to 5 microns or less by im-

pact shattering in a stream of air, thus making possible delivery directly to power-plant boilers. On this basis, Mr. Nagel assumes that in pressurized operation a cubic foot of air-fluidized dry coal powder would represent 500,000 Btu, against 70,000 Btu for natural gas, with gas at 1,000 Btu per cubic foot and coal powder at 40,000 Btu, atmospheric pressure. Consequently, to deliver the same fuel quantity in a given period of time the natural-gas line would have to be materially larger. Thus, the capital charge per 100 mi, assumed at 25c per 25,000,000 Btu for a dry coal line, would be 50c for gas. Operating charges are estimated at 25c per 25,000,000 Btu for both lines per 100 mi, making the

total pipelining cost 75c per 100 mi for gas and 50c per 100 mi for coal powder.

With the cost of coal and natural gas the same, based on \$3.25 per ton of shattered coal and 13c per MCF of pipeline-collected natural gas, delivered costs at the power-plant burners would be:

	25,000,000 Btu	
	Natural Gas, 25 MCF	Coal, 2,000 Lb
100 mi.....	\$4.00	\$3.75
200 mi.....	4.75	4.25
300 mi.....	5.50	4.75
400 mi.....	6.25	5.25
500 mi.....	7.00	5.75

Thus, with everything else the same, the difference in line size for the same fuel-quantity delivery, resulting in a difference in capital costs per unit of delivery, favors coal powder more and more as delivery distance increases.

Coal For Power

American Electric Power Co. has signed a contract to buy 18 million tons of coal over a 30-yr period from the Clinchfield Coal Co., Div. of Pittston Co.

The coal will be used to fuel a third 225,000-kw generating unit that Appalachian Electric Power Co., subsidiary of AEP, will build at the Clinch River Plant in Carbon, Va. Work on the new plant will get underway this month, according to the firms.

Clinchfield's new Moss No. 3 mine, which is only a few miles from the generating plant, will supply the coal. This mine, which is scheduled to produce about 5 million tons in 1960, is now delivering coal to the Clinch River power plant at the rate of 1,200,000 tons per year. The new order will up the total by 600,000 tons annually.

The addition to the Clinch River plant will cost \$28 million, it is reported. The Pittston Co. has invested \$50 million and the Norfolk & Western R.R. \$40 million in the region of Moss No. 3. This southwest Virginia area has become, according to some experts, the most efficient coal-mining and power-generating center in the world.

A Record—Some months ago, AEP announced it had become the first private electric utility to achieve energy sales of more than 25 billion kilowatthours during a 12-mo period.

The AEP System passed the power milestone for the 12 months ended July 31, it was reported. Sales for this period totaled 25,244,000,000 kwh.

The new record, representing an increase of 16.3% over sales of 22,654,000,-

(Continued on p 56)

DENVER

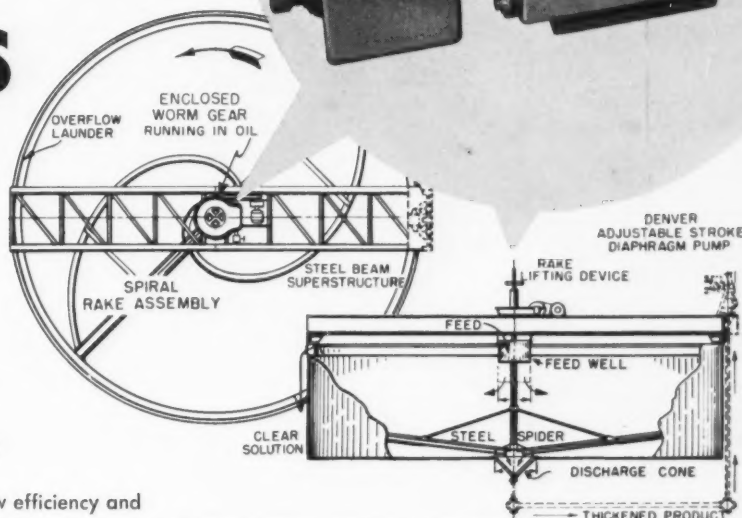
Spiral Rake THICKENERS

✓ Simple
✓ Low Cost

...for all thickening, waste treatment and clarification operations

DENVER Thickeners offer new simplicity, new efficiency and long, trouble-free service in all clarifying, thickening and de-sliming operations. Compare these distinctive advantages:

- Oversize shaft, new, enclosed, weather-proofed mechanism with simple, rugged gear carried on formica bearings. Available in sizes through 72" dia. for light, medium, heavy and extra heavy duty in tanks to 150' dia.
- Simple, effective overload indicator plus rake lifting device, either manual or automatic, to avoid damage or lost production from overloads.
- Spiral rakes move settled solids to center discharge port in only one revolution. Other types of rakes available to suit operation. Rubber covered or stainless steel shaft and rakes for acid or corrosive applications.



Before you buy a thickener... use

DENVER TESTING SERVICE to determine correct thickener size for your needs.

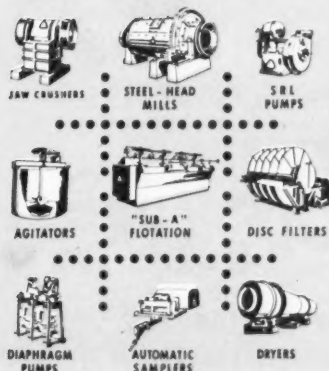
Laboratory tests, conducted at no cost to you, supply reliable data on

- | | |
|-----------------------------------|-------------------------|
| (a) Settling Rates | (d) Thickener Unit Area |
| (b) Final Density | (e) Overflow Clarity |
| (c) Effect of Flocculating Agents | |

These tests can assist you by eliminating risk of specifying a thickener that's too small to do the job or too large and costly for your needs. Ship 5 gallon slurry sample prepaid to

DENVER TESTING DIVISION
1755 Blake St., Denver, Colo.

No Cost to You
for This Test Service!



"The firm that makes its friends happier, healthier and wealthier"



DENVER EQUIPMENT COMPANY

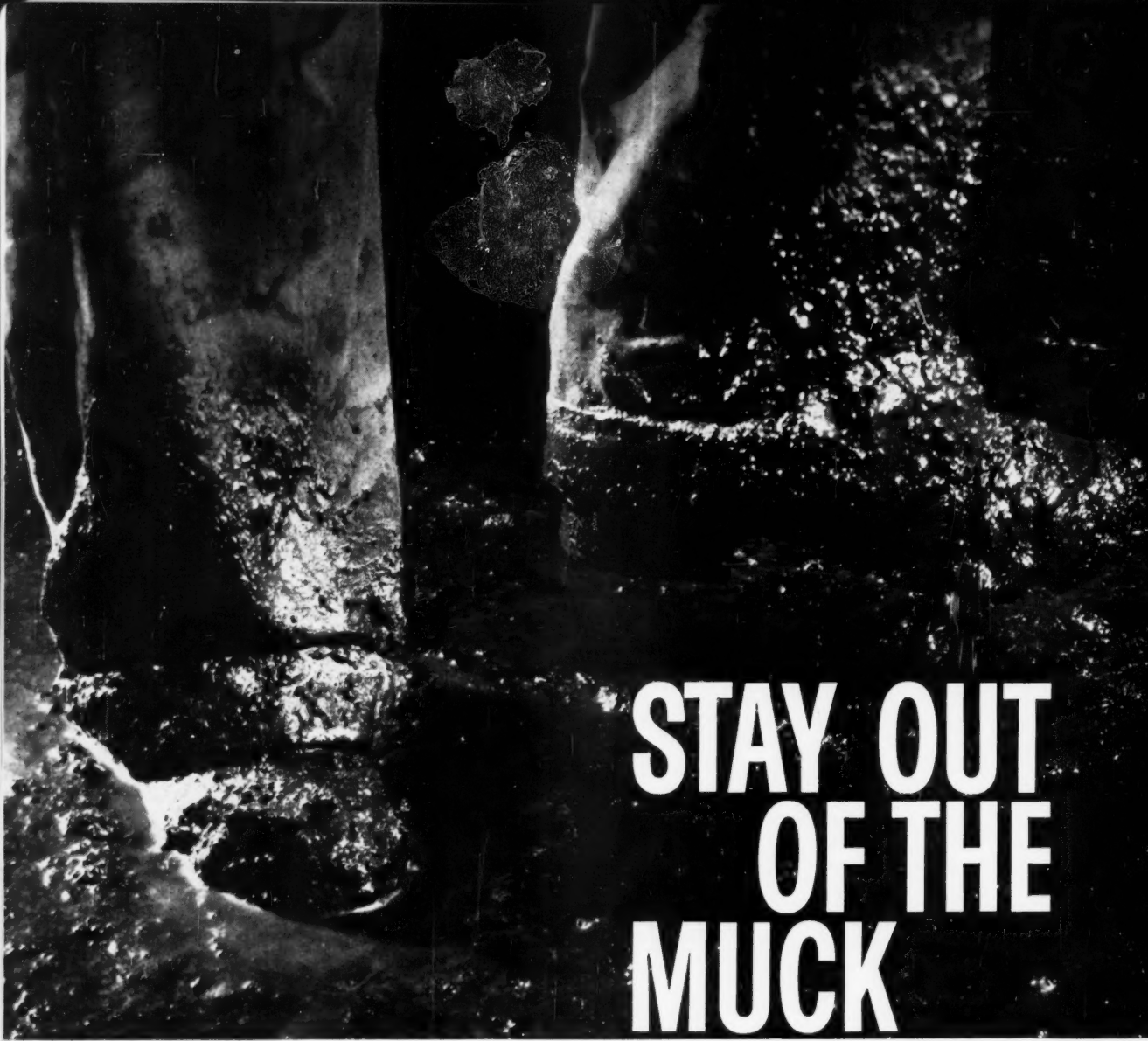
Cable DECO DENVER

1400 Seventeenth St.

Phone CHerry 4-4466

Denver 17, Colorado

- **NEW YORK CITY**
4114 Empire State Bldg.
Phone CH 4-6510
- **BLUEFIELD, W. VA.**
P.O. Box 1119 • Phone DAvenport 5-6598
- **TUCSON, ARIZ.**
3437 E. Camden St. • Phone EAst 6-7282
- **LONDON**
15-17 Christopher St., Finsbury Sq.
Phone BIshopsgate 3573
- **JOHANNESBURG**
Broadway and Ninth
Bez Valley • Phone 25-7331
- **TORONTO**
185 Bay Street
Phone EMpire 3-8836
- **VANCOUVER**
802 Credit Foncier Bldg.
Phone MUtual 3-7395
- **MEXICO CITY**
Avenida Juarez 14, Desp. 615
Phone 21-1477
- **LIMA**
Marquinarías 270
Casilla 4950 • Phone 41887



STAY OUT OF THE MUCK

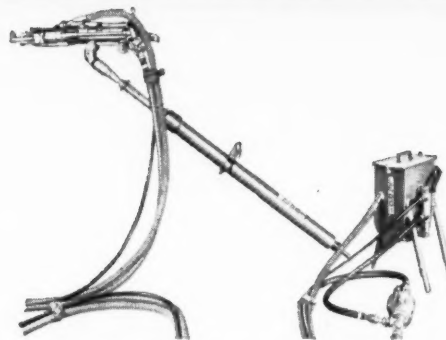
NOW—Dust-free drilling without water!

...with the Le Roi LLV Dust-collecting Air Leg Drill

You'll drill fast, dry, and clean through the hardest rock with the new Le Roi LLV Dust-collecting Air Leg Drill. It outperforms wet-drilling machines and has a much lower dust count — you don't use a drop of water in the mine or tunnel.

The LLV's efficient dust collection keeps holes clean for faster, deeper penetration — prevents stuck steels and lost holes. Its powerful suction removes cuttings through the hollow drill steel and out the side of the chuck housing. *None* passes through the machine. Results: less maintenance and longer tool life.

Ask your Le Roi distributor for a demonstration. Or write Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.



DRY "DUSTLESS" LLV collects cuttings in LX-1 dust box. Operator can empty box by remote control lever on drill.

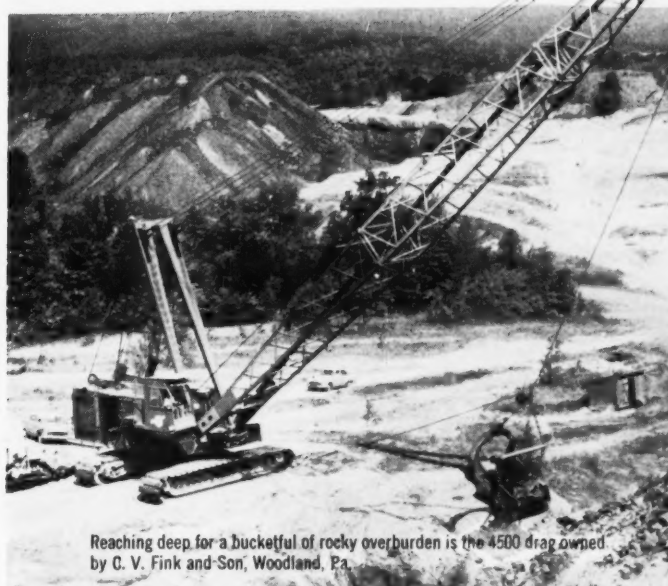
LE ROI NEWMATIC® AIR TOOLS



Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

AT-908

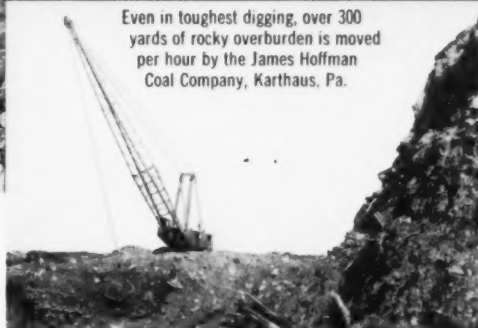
Why this stripping "favorite" dominates the strip mines



Reaching deep for a bucketful of rocky overburden is the 4500 drag owned by C. V. Fink and Son, Woodland, Pa.

DIESEL POWERED WITH THE MOBILITY TO MINE ANYWHERE

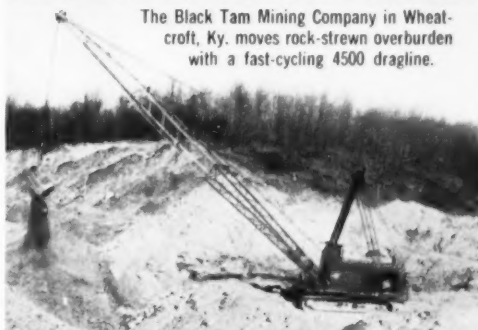
Even in toughest digging, over 300 yards of rocky overburden is moved per hour by the James Hoffman Coal Company, Karthaus, Pa.



This Manitowoc 4500 shovel produces big output at lowest cost, shift after shift.



The Black Tam Mining Company in Wheatcroft, Ky. moves rock-strewn overburden with a fast-cycling 4500 dragline.



Many of the strip mines in your area have settled on the powerful Manitowoc 4500 as their basic stripping tool.

It's easy to see the reason for this preference. The 4500 gives you advantages found in no other unit. You get a big 6-yard capacity diesel powered unit with the mobility of a "small machine" to mine scattered or large areas inaccessible to electric machines. You get far more simple, dependable design, with exclusive "Power Flo" drive; torque converter that matches power to the job; air controls; faster operating cycles; and heavy, rugged construction throughout for the toughest jobs.

Special hi-lift shovel booms and strong, lightweight drag booms provide the reach to throw spoil far from the cut — make more passes from one location. The exceptionally low ground bearing pressure of wide-span, extra long, self-cleaning crawlers lets you work right at the edge of the cut where you have maximum reach and best working visibility.

If you're interested in faster, more economical strip mining, you'll want more information from your helpful Manitowoc distributor. See him soon. And ask him for a copy of the informative booklet — "More Economical Coal Mining with Manitowoc" — no obligation, of course.

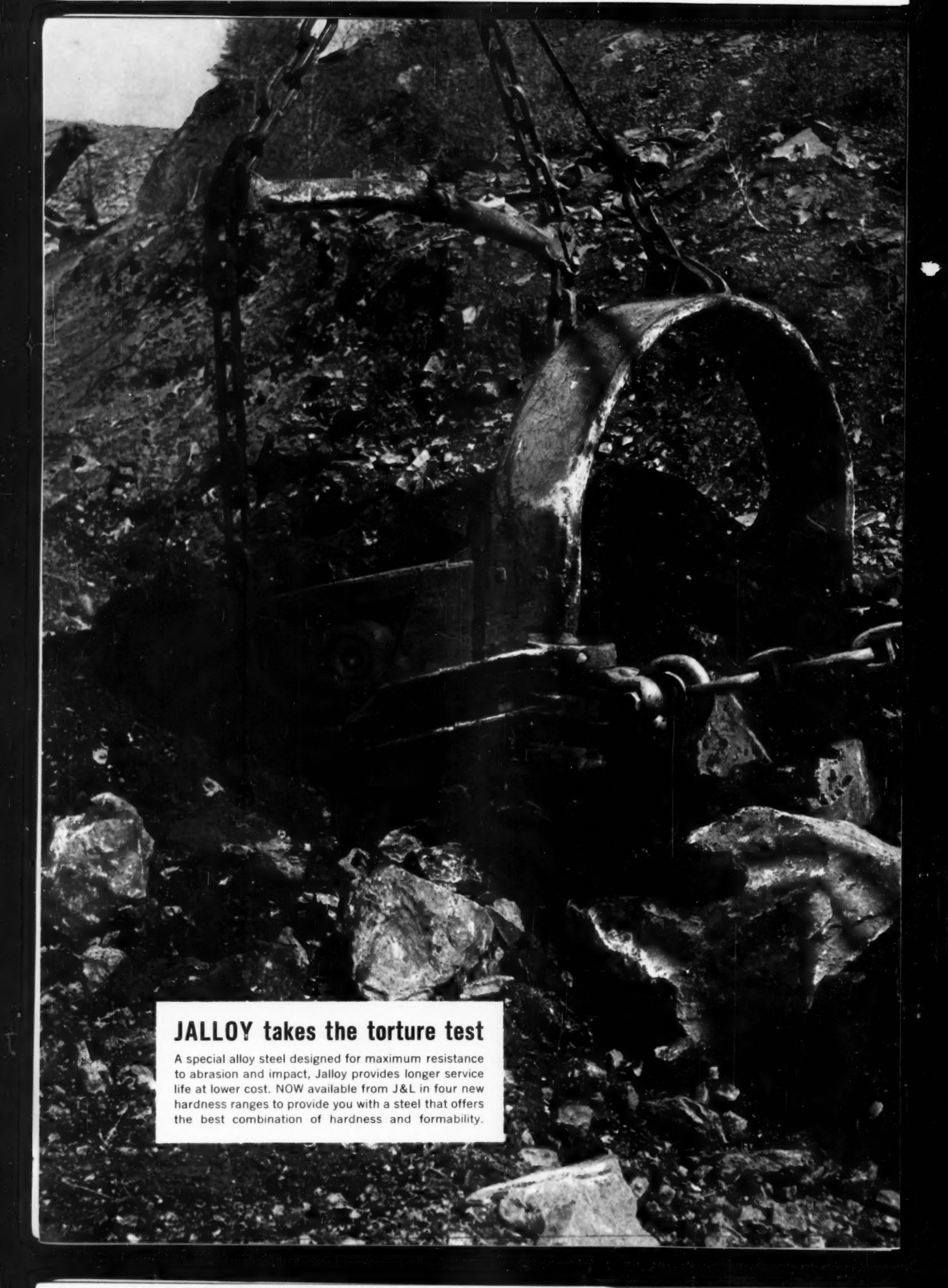
MANITOWOC ENGINEERING CORP.

(A subsidiary of The Manitowoc Company, Inc.)

MANITOWOC, WIS.

Manitowoc

SHOVELS AND DRAGLINES 1½ to 6 Yds.



JALLOY takes the torture test

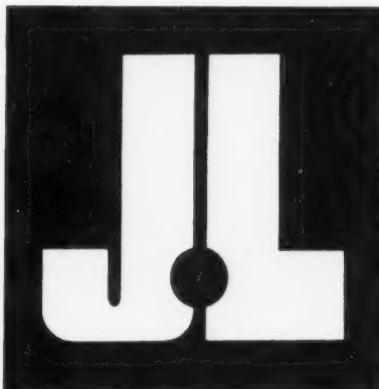
A special alloy steel designed for maximum resistance to abrasion and impact, Jalloxy provides longer service life at lower cost. NOW available from J&L in four new hardness ranges to provide you with a steel that offers the best combination of hardness and formability.



Jalloy is tougher, by three to four times, than the ordinary mild carbon steel used in conventional buckets—two to four times as resistant to atmospheric corrosion.



Jalloy is readily flame cut, easy to weld. It provides longer wear and less repair.



Jalloy is produced in four new hardness ranges to provide the flexibility to meet various needs. All four are used in this bucket.



Jalloy plates measuring 6' x 20' are cold formed to a 96-inch radius for this mammoth 9-yard dragline bucket.

Recent field tests show Sullivan Trail buckets are stronger, lighter, longer-lasting by at least 30% because . . .

bucket arches & skids & backs & bottoms & bucket jaws are all J&L JALLOY steel

Rugged strip mining operations in the anthracite coal fields around Wilkes-Barre, Pa., demand rugged dragline buckets.

A mining expert with the Sullivan Trail Manufacturing Company, West Pittston, Pa., says:

"Frequent and major repair work on conventional buckets pointed up the need for a bucket that would last longer and have greater strength with less weight."

Design of a new super-bucket began nearly five years ago with the selection of a special heat-treated alloy steel—JALLOY—for bucket areas subjected to severe stress, strain, impact and abrasion. Since then the Jalloy bucket has undergone severe field testing which indicates a 30 per cent longer life.

Recently, through close coordination with J&L's Technical Service Department, Sullivan Trail has saved money and simplified fabrication of the new bucket. By introducing a variation in heat-treatments, J&L developed a new series of *four* Jalloy hardness ranges. Each provides a different combination of formability and resistance to impact and abrasion. The Sullivan Trail bucket now employs all four Jalloy ranges.

If you have a similar problem, Jalloy is your answer. Contact your nearest distributor or J&L district office and ask about Jalloy. Or, write directly to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania, for the new booklet entitled *Jalloy*.

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

AMHERST *prepares high grade*

F I N E COAL



RAYMOND FLASH DRYING SYSTEM

OPERATING DATA

Capacity: 190 Tons of bone dry
coal per hour— $\frac{3}{4}$ " x 0.

150 Tons— $\frac{3}{4}$ " x 28 mesh.
Initial surface moisture 6%.

40 Tons of minus 28 mesh.
Initial surface moisture 23%.

Final moisture content for both 2.0%

After more than 18 months of successful operation, performance records of Amherst's initial Raymond Coal Drying installation are available on the MacGregor preparation plant at Slagle, West Virginia.

This equipment consists of two 18' Raymond Flash Dryers, complete with furnaces and drying columns. Results to date have proved eminently satisfactory on all counts:

1. Water evaporation runs slightly over 20 T.P.H., exceeding the guaranteed rating on the machines.
2. It is easy to produce and maintain a final moisture content of 2.0%. This low figure means a saving in transportation costs by avoiding excessive water-weight in shipping.
3. The 5/16" product has a discharge temperature of less than 115°F. In consequence, there has been no indication of any oxidation of the dried carbon.
4. Raymond Flash Drying has increased the as-received BTU, also the market realization and marketability of all coal grades. This has enabled Amherst to sell a considerable tonnage of fine sized coal that was formerly unmarketable because of its high moisture content.

As a result, Amherst Coal Company has installed another C-E Raymond System at its Lundale preparation plant, where the equipment is so designed as to permit future expansion by additional drying columns.

Write for Coal Drying Bulletin

COMBUSTION ENGINEERING, INC.

Raymond Division

1120 West Blackhawk St.
Chicago 22, Illinois

Combustion Engineering-Superheater Ltd., Montreal, Canada

Sales Offices in
Principal Cities



Frank F. Kolbe, Chairman of the Board of The United Electric Coal Companies, developer of the "big wheel."

The "big wheel" has muscles of Yellow Strand Wire Rope

This is the Kolbe Wheel Excavator now in operation at United Electric Coal Co.'s Cuba Mine near Canton, Illinois. It is the largest earthmoving machine ever built in America. The giant digs and moves 3,500 cu. yds. of overburden per hour, in a continuous stream, a maximum distance of 420 feet.

Muscles for the business end — the giant wheel — are Yellow Strand Wire Rope. It was specified for raising and lowering ladder and

stacker, and must carry the 476,000 lb. wheel and ladder. It is subjected to the impact of 1½ ton boulders dropping 10' or more, and the constant vibration of continuous operation.

It will pay you to entrust your critical loads to Yellow Strand, too! Contact your B & B Distributor for complete details. Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Missouri.

Yellow Strand



WIRE ROPE



SLINGS



CLIPS

People in Coal



Wide World

To Be New UMW Chief

THOMAS KENNEDY, who will become United Mine Workers president when John L. Lewis retires some time in early 1960, was born 72 yr ago in the coal mining community of Lansford,

Pa., and has been engaged in the labor activities of the coal industry for more than half a century.

Mr. Kennedy's life in labor stems from a youth spent in mining coal. In 1900, when he was only 13, he joined the Lansford local of the UMWA, and attended his first International Convention 3 yr later, prompted by a keen interest in union structure.

He became known as a clear thinker and leader and at the age of 23 became president of Dist. No. 7, one of three UMWA districts in the Pennsylvania hard coal fields. He participated in making the joint anthracite wage contract of 1912 and every anthracite agreement since that time.

Mr. Kennedy served as Dist. 7 president until 1925, when he was elected International secretary-treasurer, succeeding William Green, who became president of the American Federation of Labor.

After 22 yr as secretary-treasurer, he was named to the vice presidency. During these years, he has spent most of his time in Washington, headquarters of the UMWA, but he commutes regularly each week-end to his home in Hazleton, Pa.

Mr. Kennedy has demonstrated leadership qualities outside the union as well. In 1934 he was elected lieutenant governor of Pennsylvania, serving an active 4-yr term, but remaining as a UMWA officer. He has served as a member of the National Defense Mediation Board and on the Dept. of Interior's Solid Fuels Administration for War. He has also been on the President's Committee on Vocational Education and is very active in religious circles and various charities.

Known as a soft-spoken but determined advocate of labor's cause, Mr. Kennedy was characterized by John L. Lewis as being "amply qualified by training, character, executive ability and a lifetime of devoted and loyal service to function with credit and distinction in this office of high responsibility."

Finley H. Davis, of Lexington, Ky., has been re-elected president of the Hazard Coal Operators Association. Mr. Davis, who was chosen Nov. 16 at the association's 44th annual membership meeting, is president of Midland Mining Co. Other officers elected were C. C. Fannin, vice president, and Fred B. Bullard, executive secretary and treasurer. The association also elected the following directors: D. S. Blount, Cavalier Coal Co.; B. L. Davis, Old King Mining Co.; L. A. Hopper, Greenridge Coals, Inc.; R. H. Kelly, Fourseam Coal Corp.; H. LaViers Sr., South-East Coal Co.; F. M. Medaris, Harvey Coal Co.; R. P. Price, K&F Coal Co.; J. M. Richards, Blue Diamond Coal Co.; W. B. Sturgill, Kenmont Coals, Inc., and C. E. Walker, Jewell Ridge Coal Corp.

Raymond E. Salvati, president of Island Creek Coal Co., was re-elected president of the American Mining Congress at its annual membership meeting in New York, Nov. 30. Mr. Salvati was also recently appointed to the Norfolk & Western Ry.'s board of directors.

E. W. Sloan Jr. has been named president of Oglebay Norton Co., Cleveland, succeeding Harrie S. Taylor, who has been chosen vice chairman of the

board. Mr. Sloan, with Oglebay Norton since 1935, became a director and vice president in 1956.

The Northern West Virginia Coal Association has elected the following officers: James F. Trotter, Trotter Coal Co.—president; George R. Higinbotham, Mountaineer Coal Co., Stephen Canonic, Compass Coal Co. and W. J. B. Mayo, Eastern Gas & Fuel Association—vice presidents; and T. E. Johnson, secretary treasurer. These officers were also elected directors along with C. R. Nailler, E. R. Amos, G. Judy, H. J. Harper, J. C. Jamison Jr., R. J. Craig, F. Williams Sr., B. Showalter, E. E. Criswell, A. Phillips, P. E. McKinney, J. J. B. Stoetzer, P. Hornor, W. E. Edmonds, M. A. Williams, G. D. Curtin and A. B. Ord.

Hugh B. Lee Jr., former president of Maumee Collieries Co., Terre Haute, Ind., has been appointed vice president, sales, for Peabody Coal Co. Peabody recently purchased the Maumee properties.

Elsworth L. Hemingway has been appointed general manager of the Blk River Coal & Lumber Co., Div. of Clinchfield Coal Co. Mr. Hemingway

has been associated with the Clinchfield organization for the past 15 yr, holding executive positions in the firm's Thomas, Phillippi and Clarksburg, W. Va., branches. A native of Connecticut, Mr. Hemingway comes to the Widen, W. Va., company with a degree in mining engineering from Lehigh University and a wide range of experience in the coal mining business.

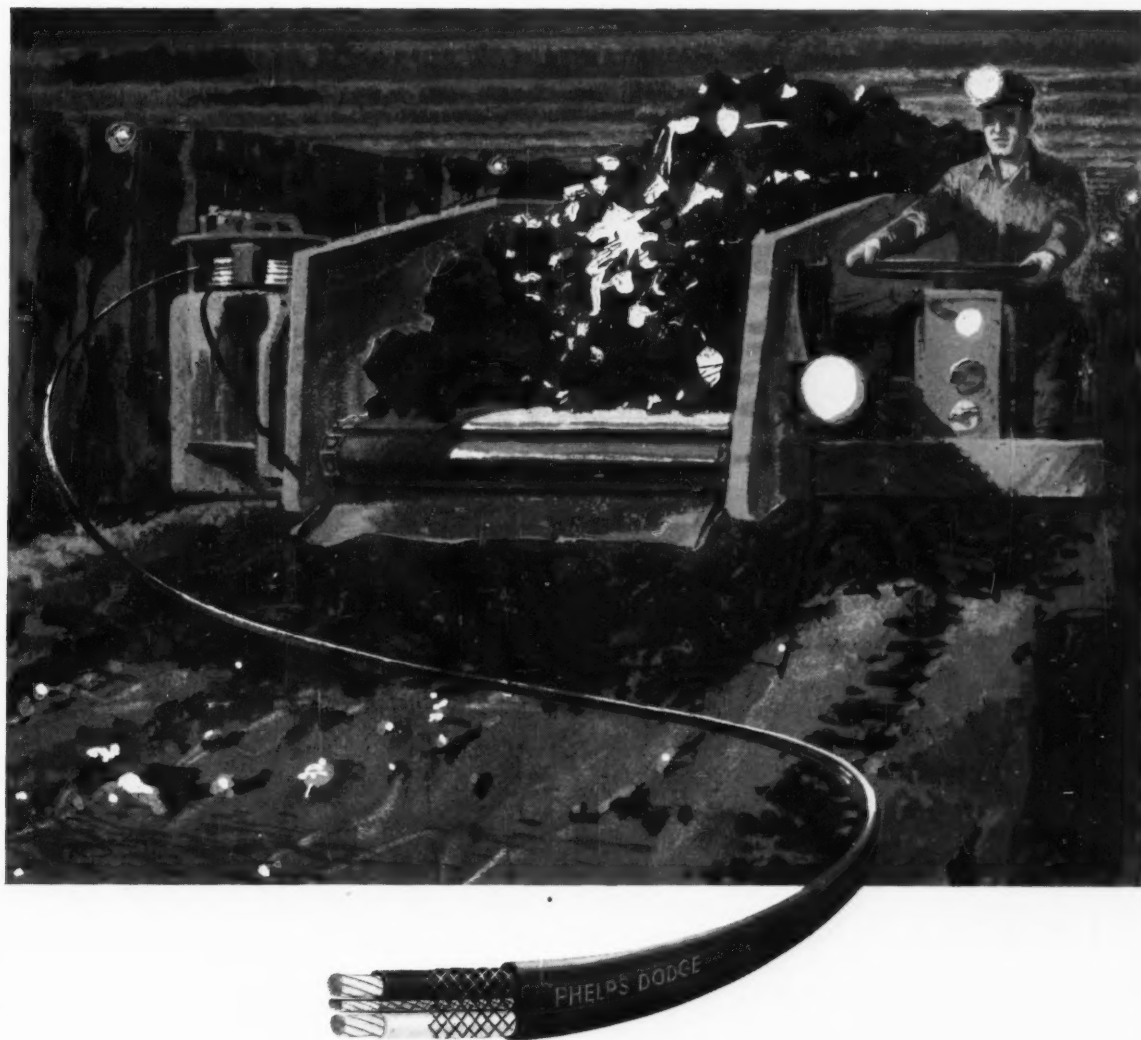
Three men have been promoted at Olga Coal Co., Coalwood, W. Va. David C. Ridenour, former mining engineer, succeeds H. E. Mauck, who has left the firm, as general superintendent. Emil John Servant Jr., former maintenance superintendent, becomes assistant general superintendent, and Charles R. Waine, former chief construction engineer, succeeds Mr. Ridenour as chief engineer.

Roscoe B. Starek, vice president, sales, of the Old Ben Coal Corp., has been named a member of the board.

Stanley Wissinger has been promoted from resident engineer at Melcroft mine of Eastern Gas & Fuel Associates to production engineer of the Northern Div. M. A. Graham replaces Mr. Wissinger as resident engineer at Melcroft.

(Continued on p 42)

SELECT THE CABLE MADE BY THE FAMOUS "MINE-TO-MARKET" FAMILY...



Phelps Dodge Mining Cable

- Made of highest quality copper from Phelps Dodge's own open-pit mines.
- Combines years of Phelps Dodge mining "know-how" with many years of cable manufacturing experience to give you the finest quality cable you can specify.
- Assures utmost protection against damage from mechanical and electrical hazards in both above and below ground mining operations.
- Listed by the U. S. Bureau of Mines, and approved by the Department of Mines, Commonwealth of Pennsylvania, P-114-BM.

First for Lasting Quality—from Mine to Market!

PHELPS DODGE COPPER PRODUCTS

CORPORATION

300 Park Avenue, New York 22, N. Y.



NEW! 30-YD CAPACITY



New Standards of

Plus the exclusive advantages of KON-TORK differential . . . a combination that means extra profit capacity for you—loading, hauling and spreading.

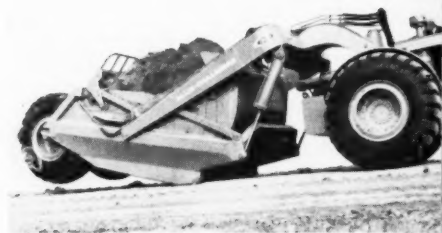
New 30-yd capacity . . . backed by 340 turbocharged horsepower gives you the size, the power and the durability to tackle any size job . . . I-system dirt, king-size dams, big state highway jobs.

The new 360 gives you more big-production features than any other big scraper, too: high-torque engine characteristics and snappy acceleration . . . full 90° steering . . . 10-ft apron lift . . . torque-proportioned traction . . . *plus* the new standards of all-hydraulic performance spotlighted at the right.

Get the full story on this all-new, all-hydraulic TS-360 from your Allis-Chalmers dealer now!

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

Everything you'd want in a big motor scraper if you were building it for your own jobs!



Double-acting bowl jacks put enough penetrating force on the cutting edge to pivot the scraper and its load clear of the ground.

KON-TORK is an Allis-Chalmers trademark.

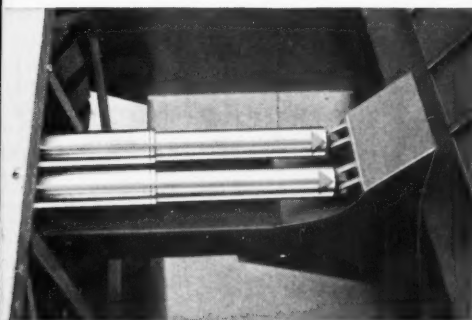
ALLIS-CHALMERS

TS

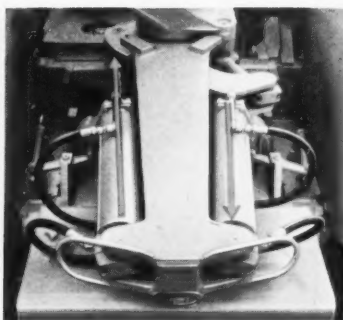
360



All-Hydraulic Performance



Twin telescoping cylinders provide smooth, forced ejection of any material... without "pumping" tailgate.



Double-acting steering jacks are fed by an independent hydraulic system... assure two-speed steering power to match any situation.



Kon-Tork differential automatically controls the distribution of torque to the drive wheels... for maximum traction to match any working condition.

move ahead with

ALLIS-CHALMERS

...power for a growing world



VICTAULIC®

The Time-and Job-Proven Method of Reducing Piping Costs

Let the Victaulic Method save you money on piping costs. Whatever piping material you choose, Victaulic can join it and provide fittings. You save in material cost, in installation time, and in reduced piping maintenance cost.

CUT COSTS WITH OVER 1100 VICTAULIC ITEMS
FOR BETTER AND EASIER PIPING



Standard Couplings



Lightweight Couplings



Rigid Couplings



Roust-A-Bout Couplings



Snap-Joint Couplings



Plainlock Couplings



Malleable Iron Fittings



Stainless Steel Fittings



Aluminum Fittings



Plastic Fittings



PVC Lined Fittings



Cast Iron Fittings



Plainlock Fittings



Vic-Groover Tools



Vic-Easy Tools



Plug Valves

For complete information on any Victaulic product, write:

VICTAULIC
COMPANY OF AMERICA

Dept. 14-1 P. O. Box 509, Elizabeth, N. J.

People in Coal (Continued)

F. Stillman Elfred, chairman of the board of Peabody Coal Co., is among a group of businessmen in the St. Louis, Mo., area named to the key corporate gifts division for St. Louis University's 150th anniversary development program. The university has a 10-yr goal of about \$46 million.

Obituaries

A. C. Slomp, 69, vice president of the Elkhorn Colliers Coal Co., died Nov. 30 in Johnson City, Tenn. Mr. Slomp had lived in recent years at Big Stone Gap, Va.

Robert Castle Norton, well known Cleveland industrialist and an early founder of Oglebay Norton & Co., died Nov. 22 at his residence in Cleveland Heights, Ohio. At the time of his death he was honorary chairman of the board of Oglebay Norton, which is a prominent iron ore, coal, vessel and dock-operating organization.

John A. Creech, 76 yr of age, a former western Kentucky coal operator and trader in coal lands, died Dec. 10 while vacationing at Naples, Fla. Mr. Creech had moved from his native Harlan County to Lexington, Ky., some time ago.

**PREVENT
CRIPPLING
DISEASES**

**BIRTH
DEFECTS
ARTHRITIS
POLIO**



JOIN THE **NEW**
MARCH OF DIMES

NF
THE NATIONAL FOUNDATION



Made its Reputation in the **SCHOOL OF HARD KNOCKS!** Roebling SH-D Portable Power Cable

From its rugged, abrasion and weather-resistant Roeprene® Sheath, right to the heart of its extra-flexible conductors, Roebling SH-D Portable Power Cable was designed to give full-power performance. The extra quality features show you why Roebling SH-D is better in terms of superior service, ease of installation and maintenance. For more facts, write Roebling's Electrical Wire Division, Trenton 2, New Jersey.

ROEBLING 

*Branch Offices in Principal Cities
John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation*

Extra—Free-riding, all-rubber fillers for moisture resistance, splicing and terminating ease, unusual flexibility.

Extra—A combination of properties which permits operation with copper temperatures up to 90° C.

Extra—Special semi-conducting tape around each super-flexible, stranded conductor to prevent ionization.

Extra—Butyl conductor insulation for outstanding electrical properties, plus heat, moisture and ozone resistance.

Current Coal Patents

By Oliver S. North

Launder washers, D. R. Mitchell and J. O'Brien (assigned to The Buckeye Coal Co., Youngstown, O.), Nov. 10, 1959. In the trough of a coal launder washer, means are provided for dividing a moving bed of coal adjacent to at least one of the boxes of the launder. Advantages of such division include increased capacity, elimination of need for concentrating tables, reduction in the amount of circulating water, and elimination of the usual dumping of solids-laden water. No. 2,912,109.

Mine haulage vehicle, A. L. Lee (assigned to Consolidation Coal Co., a corp. of Pa.), Nov. 10, 1959. Design for an improved mine shuttle car having an auxiliary pump operating only when the vehicle is traveling, when liquid pressure demand is greater. No. 2,912,184.

Coal spray composition, J. D. Neesley (Assigned to Standard Oil Co., Chicago, Ill.), Nov. 17, 1959. A composition for spraying coal for the purpose of improv-

ing weathering, resisting mechanical abrasion, and allaying dust, and particularly for the purpose of preventing degradation known as slacking, comprises about 0.25-5% of a polymeric carboxylic acid, 20-50% of a diluent hydrocarbon oil, 40-60% of a solvent extract, and preferably 10-25% of an asphalt. No. 2,913,349.

Fastening means for cutter chain pintles, J. R. Cartledge and C. B. Krekeler (assigned to The Cincinnati Mine Machinery Co., Cincinnati, O.), Nov. 24, 1959. In an improved pintle structure, the central rib is carried out to the end of the pintle with resultant increase in strength and decrease in pintle breakage. No. 2,913,917.

Specific radiation absorption capacity measurement of a solid substance, H. Dijkstra and B. S. Sieswerda (assigned to Stamicarbon N.V., Heerlen, Netherlands), Nov. 24, 1959. Method for measuring the Roentgen radiation absorption capacity of, for instance, coal; this radiation beam is compared with a second

beam to automatically adjust some processing variable in the system. This method is especially useful in washing run-of-mine coal to obtain a finished coal having an ash content constant within predetermined limits. No. 2,914,676.

Apparatus for use in classifying or both classifying and drying loose material, H. J. B. Topp, Dec. 1, 1959. Centrifugal mechanism for continuously drying and/or classifying either wet or dry finely divided material, for example coal. No. 2,915,181.

Bars for supporting the roof in mines and for like purposes, J. T. Walton (assigned to Hugh Wood & Co. Ltd., Kingsway, Gateshead-on-Tyne, England), Dec. 1, 1959. A roof bar for use in conjunction with props has its joint parts constructed for pivotal connection with adjacent similar bars, the connections then being made rigid by insertion of wedges. No. 2,915,328.

Process and apparatus for separating particles according to size, F. J. Fontein (assigned to Stamicarbon N.V., Heerlen, Netherlands), Dec. 8, 1959. Improved wet screening process and mechanism for classifying coal or the like. The novel

**It's new,
It's here-
No-Air!**

Galis "2 in 1"

**Hydraulic ROTARY-PERCUSSION
Roof Drill**

**FIRST OF ITS KIND! It's push-valve,
non-stop. BIT LIFE UP TO 10 TO 1**

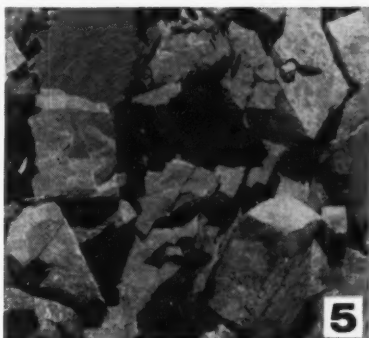
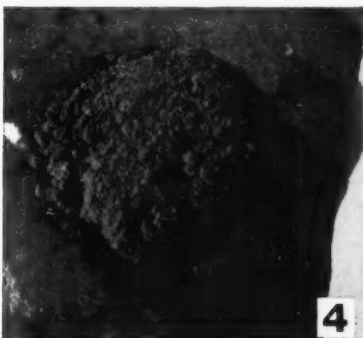
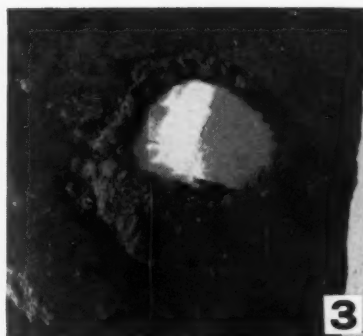
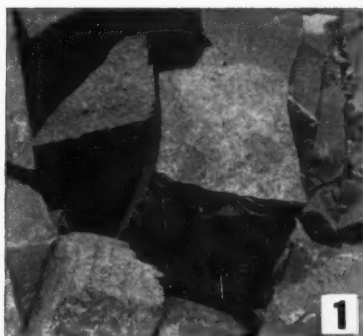
**Convert
from one to the other
at the flick of a valve!**

Bit life has been extended drastically to permit economical drilling in the hardest of sandstones **WITHOUT AIR!** Variable thrust, torque and R.P.M. of drill plus variable percussive frequency and force will produce a best combination for maximum penetration in any rock formation. Bureau of Mines approved dust collecting system. The rotary percussion unit is adaptable to all Galis drills. Write for complete specifications.



Galis
ELECTRIC & MACHINE CO.
MORGANTOWN, W. VA.

**Remember Galis for repairing and rebuilding
all underground equipment.**
Phone - 4668



1. Basalt boulder prior to blasting.
2. Spencer N-IV and 6% diesel #2 fuel oil plus 20" of 175-grain detonating cord.
3. N-IV-fuel oil mixture being placed on boulder.
4. View of completed "mudcap."
5. Boulder after blast.

"Mudcapping" Now Possible With Ammonium Nitrate-Fuel Oil Mixtures:

Another example of Spencer Chemical Company's continued research in the blasting field

The pictures above show another example of how Spencer research is finding new and better ways for using Spencer N-IV Ammonium Nitrate-fuel oil mixtures in blasting operations. Using the same basic materials and preparation used in blasting bore holes, it is now possible to do "mudcapping" for breaking up large boulders.

The Spencer N-IV Ammonium Nitrate used for each blast is put in an ice cream container and mixed with 6% diesel #2 fuel oil. The material is set on the boulder and dirt is packed around it. The charge is initiated with a loop made from 20 inches of 175-grain detonating cord.

Whether you use Spencer Ammonium Nitrate N-IV and fuel oil

mixtures for "mudcapping" or for blasting bore holes, you'll find that Spencer N-IV as an ingredient in blasting agents produces more energy than competitive grades of ammonium nitrate. That's because Spencer N-IV has a special structure that lets the prills absorb oil more easily, and N-IV contains a higher percentage of ammonium nitrate.

Yet, Spencer N-IV Ammonium Nitrate costs you no more than other brands!

Spencer Chemical Company also has available a machine scientifically designed for placement of N-IV-fuel oil mixtures into horizontal blast holes. Called the Spencer Powder Monkey, this unique device eliminates tamping bags, tamping equipment, or the labor

needed to fill and tamp bags into the hole.

For complete information, mail the coupon below:



Spencer Chemical Company
401 Dwight Building
Kansas City 5, Missouri

I want to know more about:

- ☐ Spencer N-IV Ammonium Nitrate as a blasting ingredient.
☐ Spencer Powder Monkey.

Name _____

Firm _____

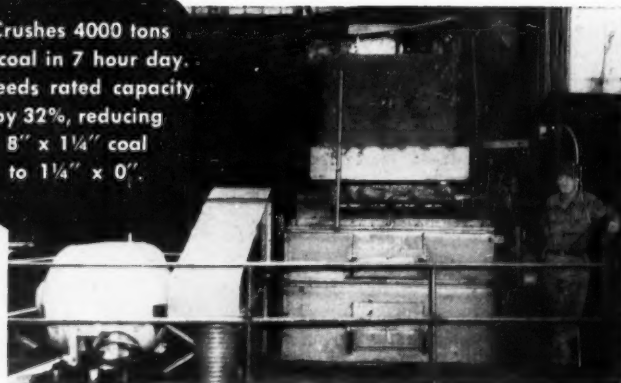
Address _____

City _____ State _____

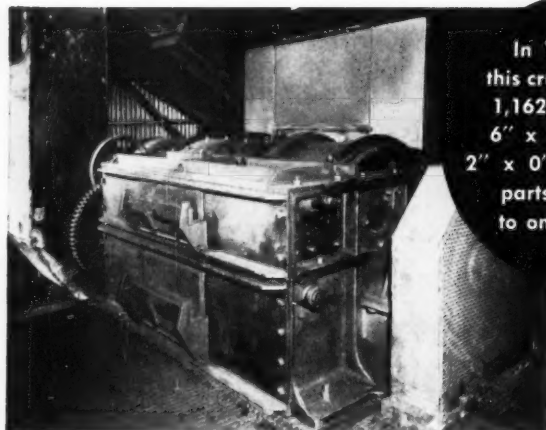
CRUSHING FACTS

on *American* COAL CRUSHERS

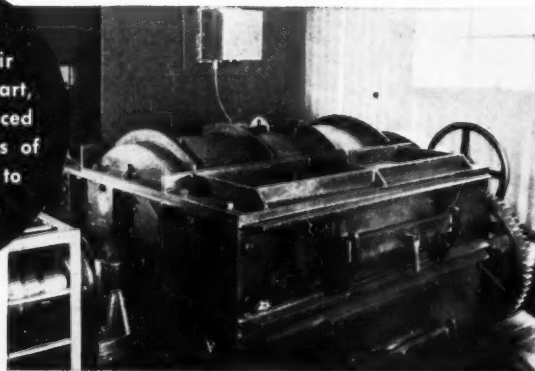
Crushes 4000 tons
of coal in 7 hour day.
Exceeds rated capacity
by 32%, reducing
8" x 1 1/4" coal
to 1 1/4" x 0".



In 18 months,
this crusher reduced
1,162,572 tons of
6" x 1 1/2" coal to
2" x 0". Replacement
parts amounted
to only \$418.00.



Without a repair
or replacement part,
this crusher reduced
over 550,000 tons of
minus 8" lignite to
a 3/4" product.



When you figure costs, the best results come from
American Rolling Ring Crushers

American

ORIGINATORS AND MANUFACTURERS

1119 MACKLIND AVE.



PULVERIZER COMPANY

OF RING CRUSHERS AND PULVERIZERS

ST. LOUIS 10, MISSOURI

Patents (Continued)

fixed screening deck is reversible, is simple in construction, occupies little space per given capacity, and is capable of screening to a finer size than can be achieved with other fixed screens. Part of the undersize is collected separately and recirculated so as to obtain a very sharp separation. No. 2,916,142.

Boring type mining machine having cutter chain cusp removing means, F. Cartledge and J. Gonski (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 8, 1959. In a continuous mining machine for operating in low seams, the gathering mechanism for picking up coal also serves to cut out the cusps of unmined mineral extending upwardly from the floor. No. 2,916,273.

Socket-engaging cutter bits, A. O. Bruestle and C. B. Krekeler (assigned to The Cincinnati Mine Machinery Co., Cincinnati, O.), Dec. 8, 1959. Cutter bit structure having positive, or non-frictional, means for maintaining the shank in the socket member. Fixed gauge abutments are used, even though the cutter bit can be driven in for use and knocked or pried off for replacements. No. 2,916,275.

Apparatus for detecting carbon monoxide, R. Valentine and H. G. Glover (assigned to Coal Industry (Patents) Ltd., London, England), Dec. 8, 1959. Design for a reliable portable apparatus for detection of carbon monoxide in mine workings. No. 2,916,358.

Equipment Approvals

Electric & Machine Supply Co.—Models 60E10B and 60E10BX shuttle cars; three motors, each 10 hp, 250 V, DC. Approval No. 2F-1509, Nov. 4.

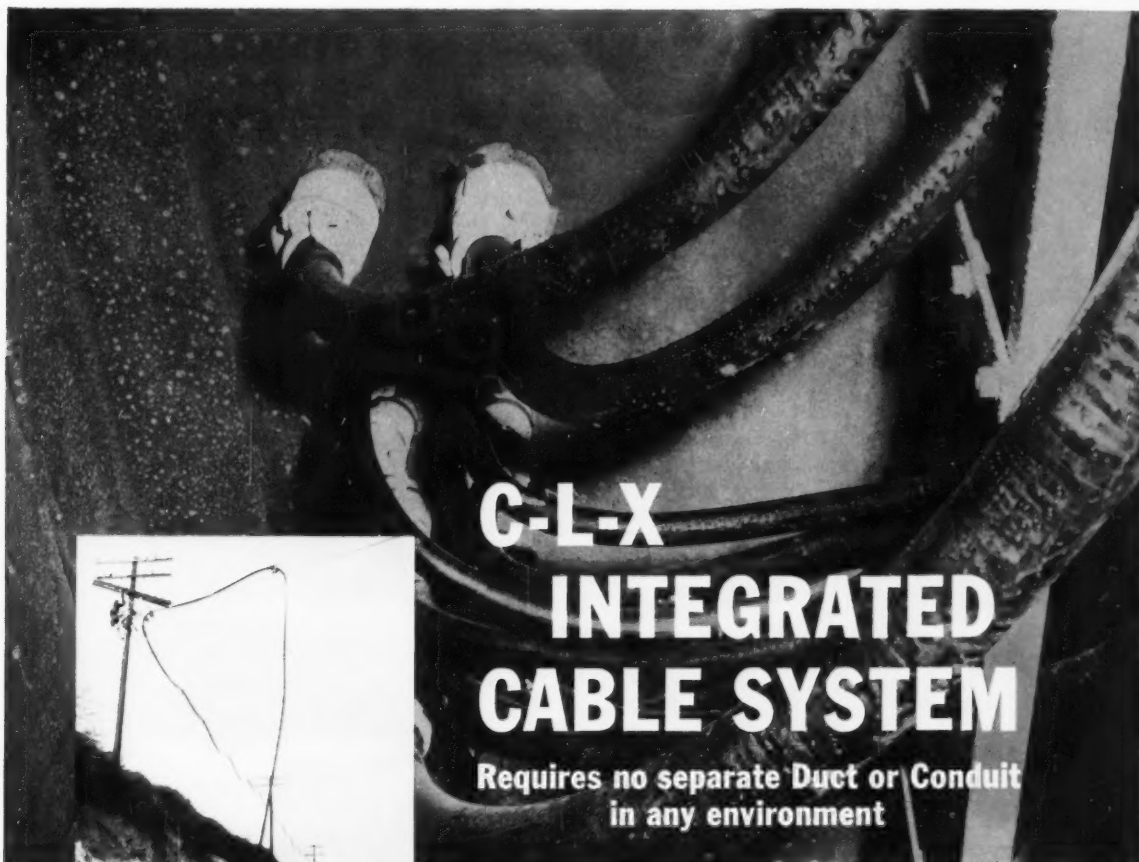
The Jeffrey Mfg. Co.—Model 52-HC crawler-mounted belt conveyor drive unit; one motor, 7 1/2 or 15 hp, 250 V, DC. Approval No. 2F-1510, Nov. 9.

Goodman Mfg. Co.—Type 967-B tractor tread loader; four motors, each 20 hp, 500 V, DC. Approval No. 2F-1511A, Nov. 16.

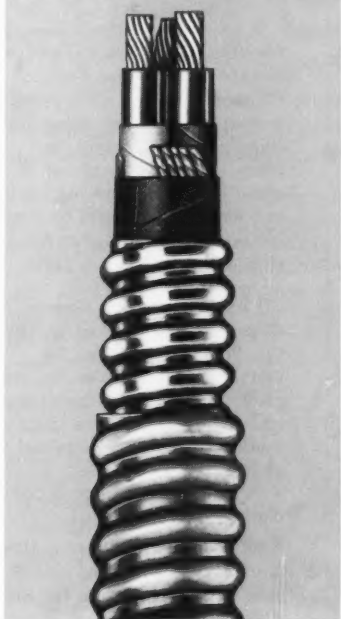
Goodman Mfg. Co.—Type 967-B tractor tread loader; four motors, each 20 hp, 250 V, DC. Approval No. 2F-1512, Nov. 18.

The Jeffrey Mfg. Co.—Type ML-81C loading machine; five motors, four 15 hp and one 6 hp, 250 V, DC. Approval No. 2F-1501, Nov. 18.

Goodman Mfg. Co.—Type 670-20 shuttle car; three motors, each 10 hp, 230 V,



Unusual pliability of C-L-X Sheathed Cables is shown here as the cable is being installed.



The revolutionary C-L-X Continuous, Corrugated, Lightweight, metallic sheath, that Simplex introduced to this country two years ago, is now available in *Aluminum*, *Copper* or *Bronze* as well as the enormously successful *Steel*.

Simplex C-L-X pliable cable systems provide unexcelled ease of installation and mechanical protection.

The *corrugated* metal sheath combines pliability for ease of installation with very great strength and seals the cable against penetration by oil, chemicals and moisture.

Depending on the environmental conditions of the installation, these power, control and communication cable systems can be furnished with or without plastic jacketing.

Light, and pliable, C-L-X cables are easily installed, and require no special reels.

Now, with corrugated *Aluminum*, *Copper* or *Bronze* sheathed C-L-X cable systems, the low resistance of these metals permits designs where the sheath may be used as a neutral or ground. These metals also permit the use of single as well as multiconductor cable assemblies in a-c power systems.

For complete details on C-L-X sheathed cables, contact your Simplex Engineer, or write direct.

Simplex

WIRE & CABLE COMPANY

79 Sidney Street, Cambridge, Massachusetts

See C-L-X
in Steel, Copper
and Aluminum at
the PLANT MAIN-
TENANCE SHOW
BOOTH NUMBER 212

MASTER MECHANICS CORNER:



Russ Hill, Master Mechanic in charge of 67 machines for Holloway Construction Co., building 27 miles of highway... Albion to Battle Creek, Michigan

"Only Cat Dealers offer so many services . . . parts assembly exchanges, rebuilding, shop and field repairs and immediate availability of almost all parts."

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.
Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Guyan[®]
HEATERS

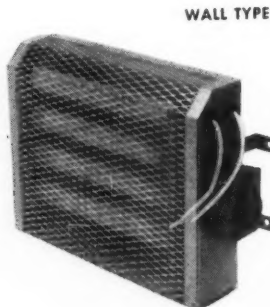
FOR CONFINED AREAS

ALSO AVAILABLE IN FLOOR TYPE

**RUGGED
and ECONOMICAL TOO!**

WHEN the space is hard to heat — such as a crane or locomotive cab, a pump house or small office — a GUYAN natural convection heater is the answer. It is a **DEPENDABLE, LONG-LIFE HEATER** consisting of corrosion-resistant aluminum chromium wire — wound on ceramic forms — and mounted within expanded steel housings. GUYAN Heater Units are ruggedly built to stand the hard service that is customary in tough industrial applications. Available from 1,500 thru 7,500 watts for 110, 220, 440 volts DC or AC. Priced right — more economically than you might think — and lower than you can make your own. Write for complete information.

GUYAN MACHINERY CO.
LOGAN, WEST VIRGINIA



Guyan[®]
HEATERS

Approvals (Continued)

DC. Approval No. 2F-1513, Nov. 19.

Goodman Mfg. Co.—Type 670-21 shuttle car; three motors, each 10 hp, 230 V, DC. Approval No. 2F-1513, Nov. 19.

The Long Co.—Conveyor power unit; one motor, 15 hp, 220 V, AC. Approval No. 2-827, Nov. 25.

Preparation Facilities

Atkins Coal Co., Frackville, Pa.—Contract closed with Wilmot Engineering Co. for one heavy-media system with a No. 526 Wilmot-OCC heavy-media vessel for preparing various sizes of anthracite. Capacity is 75 tph.

Underkoffler Coal Service, Williams-town, Pa.—Contract closed with Wilmot Engineering Co. for design and construction of a new heavy-media plant with Wilmot's automatic AccuRay specific-gravity control. A No. 526 heavy-media vessel will handle 75 tph of various anthracite coals.

Anthracite Fine Coals, Inc., Donaldson, Pa.—Contract closed with Wilmot Engineering Co. for design and construction of a new fine-coal preparation plant to prepare a mixed feed of 50% bank and 50% raw coal. Four Wilmot Hydro-tators and one classifier will prepare 200 tph of various anthracite coals.

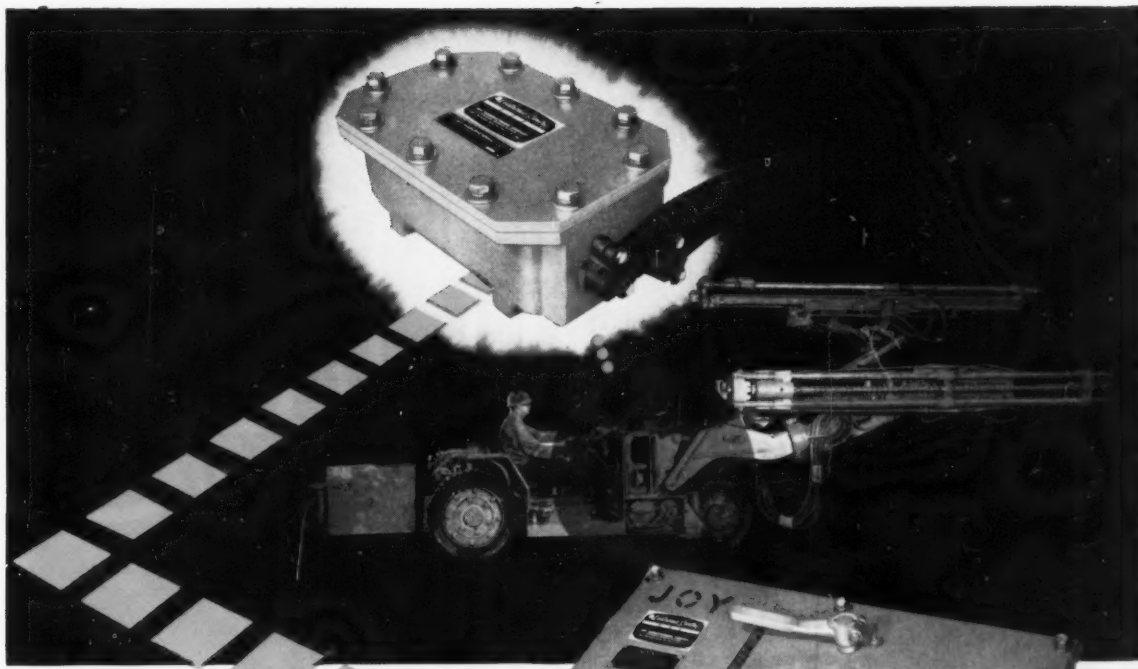
Oakwood Coal Co., Pine Grove, Pa.—Contract closed with Wilmot Engineering Co. for one 24x24 high-speed roll to crush 20 tph of various anthracite coals.

R. T. Bliss & Son, Hauto, Carbon County, Pa.—Contract closed with The Deister Concentrator Co., Inc., for six Concenco Diagonal-Deck No. 7 washing tables, one Leahy heavy-duty "No-Blind" vibrating screen and one Concenco Model 208 revolving feed distributor. The equipment will be installed in a new plant and will be used to clean Nos. 4 and 5 buck sizes of anthracite coal.

Elkfoot Coal Co., Grundy, Va.—Purchase authority granted to The Daniels Co., Bluefield, W. Va., for a complete DMS dense-media precision preparation plant. Completion of installation at several mines in eastern Kentucky and southwestern Virginia expected in Spring of 1960.

Next month . . .

"Kick-Off Year for a Decade of Growth"—Economic review of 1959-60 points to firm prospects for coal's future growth.



NOW!
complete protection
without a frame ground wire!
lower maintenance cost... less down time!

JOY • *Electronic Sentry**

Here at last is positive protection against ground faults and short circuits for all D. C. operated off-track mining machines and their trailing cables.

The JOY — ELECTRONIC SENTRY offers a degree of protection never before possible. An ever-present monitoring signal is interrupted when trouble occurs and an automatic circuit breaker acts instantaneously to remove power from the complete machine and trailing cable. There is no destructive arcing due to heavy fault currents as in the case of operation with a ground wire. There is no false sense of security as the Electronic Sentry must fail safe!

*PAT. PENDING.

Accepted by U. S. Bureau of Mines for Use on Permissible Equipment.

The ELECTRONIC SENTRY prevents energizing equipment when a dangerous condition exists, whether it be a ground fault in the machine itself, a short circuit in the machine or its trailing cable, or a broken or open cable conductor — and it distinguishes between normal overloads and short circuits.

Because it can provide this positive safety *without a grounding conductor*, it permits the use of lower cost, 2-conductor cable — which means more cable in the same space for greater flexibility and distance of movement. Another plus bonus: reduced cable maintenance and less down time of equipment.

Write today for detailed information.

CD-4533

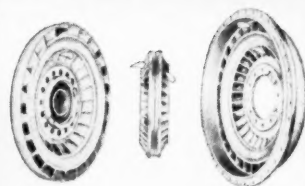
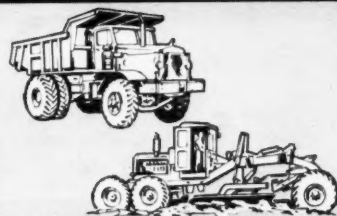
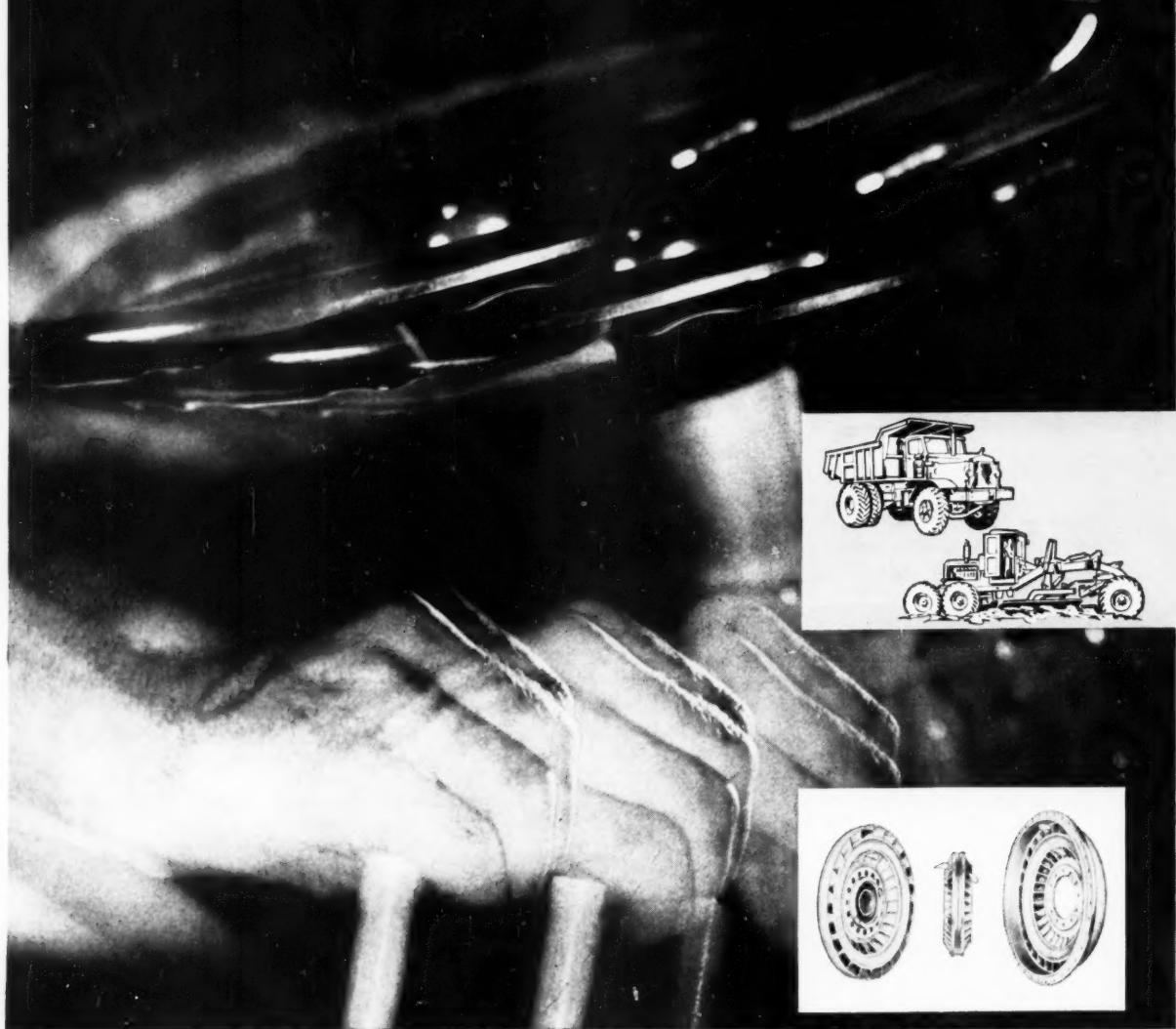
JOY

**ELECTRICAL
 PRODUCTS
 DIVISION**

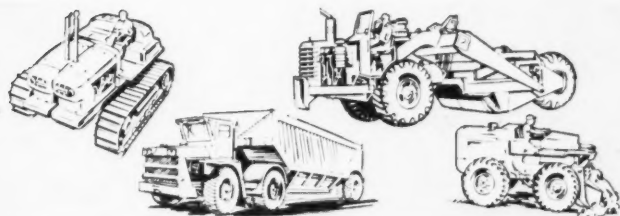
1205 Macklind Ave., St. Louis, Mo.

Exec. Offices, Henry W. Oliver Bldg., Pgh., Pa.

What's it costing



you to keep the "stick"



EVEN IF YOU HAVE only top operators on all your equipment, the cost of keeping a stick-shift comes to a pretty penny: too-frequent, high repair bills for unavoidably shock-loaded drive lines and axles—engines being overhauled twice as often as necessary at \$1,200 to \$1,500 per overhaul—and, of course, those incessant clutch repairs and replacements.

No Operator Matches TORQMATIC Efficiency—

—for no operator can handle the stick as smoothly and efficiently—*every time*—as an Allison TORQMATIC DRIVE.

TORQMATIC adjusts your engine output and speed—automatically—to meet every change in load or terrain. It never fatigues—no matter how long or how tough the job. It needs no costly training—in fact, TORQMATIC owners report they're saving between \$1,500 and \$2,000 every time they train a driver because rookies can't make a shifting or clutching mistake.

It's Working for You or Against You

So it's easy to see that a TORQMATIC DRIVE is a real money saver. One thing is sure: you're either cashing in on its advantages on every job you bid for—or competing against men who do, who bought TORQMATIC because they looked at *total* cost, not just *first* cost.

And remember—TORQMATIC is available in almost every type—and well over 100 makes—of equipment. It's been proved—on years of tough jobs—far beyond any other hydraulic transmission. Just see your dealer—or write Allison for details.

ALLISON DIVISION OF GENERAL MOTORS
Indianapolis 6, Indiana

In Canada: General Motors Diesel Ltd., London, Ontario

Allison

TORQMATIC® DRIVES

THE MODERN DRIVE FOR MODERN EQUIPMENT

Built stronger to last longer—Allison casts its converter for extra strength, greater precision—and the converter is *integrated* with the transmission for a neat, easily serviced installation.

NOLAN Automatic Loading Station

**increases production
and profits!**



NOLAN Automatic Loading Station (at top)
with NOLAN Hold-a-Trip in distance



Trip being fed by NOLAN Porta-Feeder



(at left) NOLAN
Automatic Loading
Station

(below) NOLAN
Hydraulic Porta-
Feeder

(below) NOLAN
Hold-a-Trip



**WRITE
FOR
FREE
CATALOG**

Nolan Sales Agents:

George C. Hutchinson, Jr., 800 Kennan Building,
Pittsburgh, Pa.; Huntington Supply & Equipment
Co., 423 First Huntington Nat'l Bank Bldg., Hun-
tington, W. Va.; E. C. Horne Machinery Co., 1726
Champa Street, Denver 2, Colorado; Frank C. Ham-
mett, P.O. Box 154 Castle Gate, Utah; J. L. Thomas,
429 South 24th Street, Birmingham 5, Alabama;
John North Associates, P.O. Box 105, Harbert, Mich.
(Chicago District); Levitt Safety Limited, Toronto 10,
Canada.

THE NOLAN COMPANY
106 Pennsylvania St. Bowerston, Ohio

Coal Abroad

Gasification Plant Wins Approval

British government authorizes construction of \$25 million project to utilize surplus coal.

Work is slated to start early this year on a Lurgi gasification plant to be located at Coleshill, Eng., near Birmingham.

To be operated by Britain's West Midlands Gas Board, a division of the nation's nationalized gas industry, the plant, which has been under consideration since 1952, is expected to cost about \$25 million.

Detailed plans drawn up by Woodall-Duckham Construction Co., Ltd., gas plant contractors, include latest modifications recommended by the German manufacturers of the Lurgi plant, Lurgi Gesellschaft Fur Warmetechnik MB.H.

Savings—The plant will use about 410,000 long tons of coal annually from East and West Midland pits, initially supplying an estimated 40 million cu ft of gas a day. Net saving to the Gas Board after providing for full capital charges on the plant, transmission mains and other equipment is estimated about \$840,000 a year. Production should start around the end of 1963.

Specialized—An experimental Lurgi plant has been working for some time in Scotland, but construction of further such plants has been delayed by difficult conditions needed for their successful operation. Plants must be relatively large and operate on base-loads, and site choice is restricted by the problem of disposing liquid wastes.

Authority feels that the reorganization must be carried out at a pace which will avoid undue social or economic dislocation.

USSR—A new branch of industry, peat chemistry, is being carried on in the Soviet. Peter Belkevich, member of the USSR Academy of Science, has reported that scientists have worked out and tested methods of obtaining peat gas suitable for synthesis of organic acids, ammonia and other valuable products.

SOUTHERN RHODESIA—Wankie Colliery, in this nation, one of the largest coalfields in Africa, may have to cut back production by 600,000 tons over the next two years as more and more power from the Kariba hydro-electric plant on the Zambesi River in the Federation of Rhodesia is produced.

FRANCE—A tax of from 2 to 4% on industrial fuel oil to help finance reconversion of certain coal mines was proposed to French Parliament recently by minister of industry, Jean-Marcel Jeanneney, as a basis for his plan to co-ordinated French energy production. According to Mr. Jeanneney, fuel-oil sales will grow as a result of closing some mines. Therefore, reasons the minister, it is normal for part of the reconversion cost to be borne by those who will benefit.

Cutting Down

Measures to make Belgian coal competitive within the common market are under way. Overproduction and oil competition has hit Belgium about the hardest of all the nations in the European Coal and Steel Community.

The central feature of the new streamlining program is the reduction of capacity to 23.4 million tons by 1962—a cut of 5.5 million tons. It is expected that this tonnage cut will put 27,000 miners out of work. In 1959 alone, 10 pits representing 2 million tons of capacity closed down.

Over the three-year period, nine of fourteen pits in one major coal area will be closed and the remaining five pits in the coal field will be grouped into a single firm.

The High Authority of the ECSC has agreed to subsidize the Belgian coal industry in the coming years. While the situation calls for fast action, the High

Bituminous Output

YEAR TO DATE	PRODUCTION
Dec. 19, 1959	391,722,000
Dec. 20, 1958	398,682,000
1959 output 1.7% behind 1958.	
A month earlier output was 1.8% behind 1958.	

WEEK ENDING	PRODUCTION
Dec. 19, 1959	9,095,000
Dec. 20, 1958	9,442,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Dec. 19, 1959	18,897,000
Dec. 20, 1958	20,578,000
1959 output 8.2% behind 1958.	
A month earlier output was 9.1% behind 1958.	

WEEK ENDING	PRODUCTION
Dec. 19, 1959	435,000
Dec. 20, 1958	491,000

How Tom Orlovsky keeps shuttle cars shuttling

Shuttle car rolls. Grinds. Whines. Tugs.

Torture for cable. Scrape. Twist. Soak. Crush. Bend.

Can the cable take it? Tom Orlovsky, Rome Cable salesman in the Huntington, West Virginia area, says *yes* . . . if it's Rome 60 Duplex shuttle car cable.

He has good reason. No matter how you twist or flex this rugged cable, the sheath won't separate from the conductors. Sheath, web, power conductors and ground are an integrated unit.

For instance—the cable's rugged neoprene jacket and braided conductors are *meshed* together to prevent the conductor from slipping. An increased number of strands in the ground conductor and power conductors make it highly *flexible*. And a closely woven fibrous covering on the ground conductor minimizes the mechanical working of individual strands.

Rome's shuttle car cable may be just what *you* need to keep cars shuttling in your mines. Get a two-foot sample length from your Rome Cable salesman; test it yourself.

No damaging bend—just a flip-over. When flexed in use, Rome 60 Duplex flops over and bends on its minor axis. Its interlocked construction forces the change and causes a flip-over, **not** a breakdown.



◀ **Tom Orlovsky, Rome Cable salesman**, has his home and headquarters in Huntington, W. Va.—where he answers the needs and problems of West Virginia mines. Before coming to Rome, Tom spent time as an electrical contractor, electrical shop foreman, and manufacturer's representative—qualifying him to recommend the **right** electrical system for you.

ROME CABLE Department 1510

- ☐ Please send me a sample of Rome 60 Duplex cable.
☐ I want to "Meet The Man" who can tell me more.

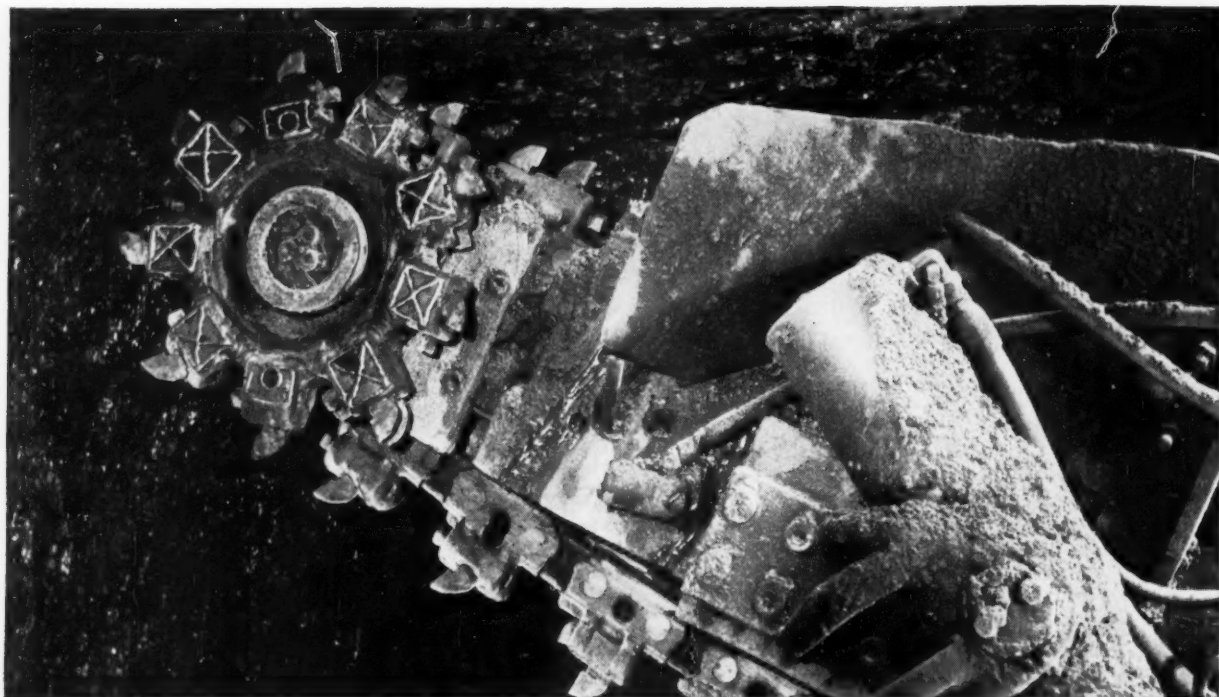
Name

Title Company

Street

City Zone State





It's better to buy **GOOD** quality now

Bits, bolts, belts and brattice are all made and sold by following certain economic laws. You can't pay a little and get a lot.

"If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that you will have enough to pay for something better."

John Ruskin

No other bit insures production like a **KENNAMETAL** Bit

The quality of carbide cutter bits often makes the difference between a \$100,000 mining machine that is mining coal and one that is down for changing bits. Kennametal Bits are consistently high in quality to protect your investment by keeping expensive machines on production. Kennametal carbide quality is the result of rigid and complete process control.

For more than 13 years, Kennametal Engineers have been developing stronger, more efficient mining tool designs and you can look first to Kennametal for the latest advances.



Kennametal Cutter Bits are available in 24 tip and shank designs, for medium, hard, and severe cutting. Shank styles to fit all popular chains.



Kennametal Drill Bits are produced in over 20 tip and shank designs, for low cost drilling in coal, clay, slate and shale.



Kennametal Roof Bits assure speed and efficiency of rotary drilling in medium, hard, and severe roof. Available in several tip and shank designs.



Kennametal Augers have flame-hardened scrolls, are available with twist, threaded, square and hex shanks. Small diameter augers are made on solid centers, while larger augers are made on aircraft quality tubing to give maximum strength and resistance to bending.



... than pay for POOR quality later

Nowhere can you find a better qualified service organization

Kennametal Representatives are all experienced mining men. They understand mine problems . . . speak the language. In every major coal-producing area, there is a Kennametal Representative. Call him for helpful assistance on your cutting and drilling problems . . . test demonstrations of Kennametal Bits designed to solve specific cutting problems . . . guidance in use and maintenance of the tools selected.

97221



KENNAMETAL REPRESENTATIVES

ILLINOIS—John D. Wingard, Benton, Ill.—Phone: GE 8-8811
INDIANA—Charles P. Adams, Vincennes, Ind.—Phone: 3299
KENTUCKY, EAST—
 Birchell R. Helton, Barbourville, Ky.—Phone: LIncoln 6-3727
KENTUCKY, WEST—Charles P. Adams, Vincennes, Ind.—Phone: 3299
OHIO—Robert T. Smith, Glenshaw, Pa.—Phone: HUter 6-5722
 C. Arnold Riggs, Crooksville, Ohio—Phone: 4104
PENNSYLVANIA, CENTRAL—
 Dario S. Parisi, Cadogan, Pa.—Phone: ROger 2-9964
 Dick W. Welch, Rimersburg, Pa.—Phone: 113
PENNSYLVANIA, NORTHEAST—
 Mike K. Cooke, Wyoming, Pa.—Phone: Wyoming 49

As a buyer of mining tools . . . you should *expect* fast service. And Kennametal can provide it. A telephone call to your Kennametal representative or distributor is all it takes. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania. Phone Bedford 755.

Eight strategically located Kennametal Distributors provide fast action on all Kennametal tool orders:

Bit Grinding Service Inc., Carlsbad, N. Mex.

Central Supply Co. of Virginia, Inc., Andover, Va.

Erwin Supply Co., Shinnston, W.Va.; McClure, Va.

Fairmont Supply Co., Washington, Pa.;
 Bluefield, Fairmont and Ravenswood, W.Va.

McGinnis Bros. Bit Service Inc., Latrobe, Pa.

National Mine Service Co.

Jenkins and Madisonville, Ky.; Forty-Fort and Indiana, Pa.;
 Beckley, Logan and Morgantown, W.Va.

Pennsylvania & West Virginia Supply Corp.

Cowen, Morgantown, and Triadelphia, W.Va.

Salmon & Co., Inc., Birmingham, Ala.

PENNSYLVANIA, SOUTHWEST—

Max J. Caylor, Mars, Pa.—Phone: National 5-9011

TENNESSEE & ALABAMA—

Douglas L. Tunsberg, Chattanooga 11, Tenn.—Phone: OXford 8-3021

UTAH—J. Vaughn Wilcox, Springville, Utah—Phone: HUter 9-5541

VIRGINIA—Jack W. Begley, Bluefield, W.Va.—Phone: DAvenport 7-8376

WEST VIRGINIA, CENTRAL—

Ben Teano, Oak Hill, W.Va.—Phone: HObart 9-9544

WEST VIRGINIA, NORTHERN—

Dale Christopher, Morgantown, W.Va.—Phone: 9503

Stewart Edwards, Waynesburg, Pa.—Phone: 1734

WEST VIRGINIA, SOUTHERN—

Jack W. Begley, Bluefield, W.Va.—Phone: DAvenport 7-8376

Donald L. Leabee, Belfry, Ky.—Phone: Williamson, W.Va. AD 7-4468

News Roundup (Continued)

000 kwh for the parallel period in 1958, was established in the face of the nationwide steel strike which was in effect during the final 17 days of the 12-month span. AEP is a major supplier of electric power to the steel industry.

In commenting on these results, AEP president, Philip Sporn, said: "Besides the general high level of economic activity in the country, many specific factors unique to our operating area contributed to this new sales mark. Notable were increases in our company's aluminum, steel, ferro-alloy and chemical loads; improvement in coal production; and the higher residential and commercial use due to increased acceptance of electric home and commercial heating."

In this connection, he pointed out that electric home heating on the AEP System recently had passed the 15,000 mark in the number of residential customers being billed for electric heating.

"Our average residential electric heating customer is now using 20,800 kwh per year for all his electricity requirements," Mr. Sporn said. "For this energy he is paying an average of 1½¢ per kwh, or about \$312 a year. In some cases, the total cost for all his electric

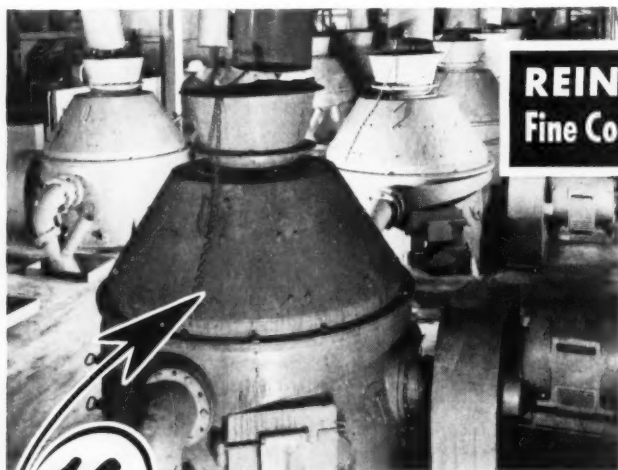


SPEAKERS for the Dec. 5, 1959, meeting of the National Mine Rescue Association, Fred J. Bailey Post No. 4, held at the West Frankfort Country Club, West Frankfort, Ill., included (right to left): C. L. South, safety director, Bell & Zoller Coal Co.; T. Garwood, asst. vice president in charge of operations, Freeman Coal Mining Corp.; J. Phalan, chief, Kentucky Dept. of Mines & Minerals; E. Bayless, foreman, Old Ben Coal Corp.; S. Douglas, electrical engineer, U. S. Bureau of Mines; C. C. Quirey, superintendent, Pittsburg & Midway Coal Co; and F. Solisek (not shown), safety director, Freeman Coal Mining Corp. Mining men from Illinois, Missouri, Indiana, Kentucky, Pennsylvania and Washington, D. C., attended the meeting.

uses—not only heating and cooling but also cooking, laundry, water heating and scores of other household tasks—has proved to be less than the cost of another heating fuel alone.

"This growing acceptance of the all-electric home," Mr. Sporn continued, "not only foreshadows the time when 25% of all American homes will be all-electric homes, but their influence on the national average annual residential use will be to lift it to a figure of close to 10,000 kwh per year. And the influence of this will extend to all industry and particularly to the entire electrical industry."

The AEP System provides electric service to over 5,000,000 people and 2,300 communities in seven states: Indiana, Michigan, Ohio, Kentucky, Tennessee, West Virginia, and Virginia.



REINEVELD
Fine Coal Dryers

14

Fourteen Reineveld Fine Coal Dryers operate at Clinchfield Coal Company's new Preparation Plant Moss #3.

This demanding producer of quality coal is highly satisfied with the performance of his battery of Reinevelts as they give him high capacities, consistently high rate of water removal and very low operating and maintenance costs.

For your drying needs select the Reineveld—its performance is uniformly good.

HEYL & PATTERSON, inc.

55 FORT PITT BLVD., PITTSBURGH 22, PA.



Mines, Companies

Eight coal companies were permanently enjoined recently from discharging coal slack and other harmful substances in Pond River in Hopkins and Muhlenberg counties, Kentucky.

The injunction was originally sought by the late C. B. Moore, owner of a 528-acre farm on Pond River. Mr. Moore charged harmful substances from the coal firms were carried into the waters and deposited on his land, causing damage to the productivity and fertility of the land. The coal firms argued their operations have not served to increase the long-time polluted condition of the river, but the court said: "We consider it sufficient that they have continued the condition."

The Central West Coal Co. has announced plans for operating a new mine in the Blackwater coal field in northern West Virginia.

The mine, near the Allegheny Front and around Stoney River, is one of the

largest blocks of commercial quality coal left in the country, according to the firm. To help develop the field, the Western Maryland R.R. Co. is completing trackage of approximately 10 mi in length. The new field will be strip mined and Central West also has a 2,000 tpd deep mine under development.

Louis Pagnotti, head of Sullivan Trail Coal Co., West Pittston, Pa., has announced plans to resume mining at Franklin Colliery in the near future.

The property, leased from Lehigh Valley Coal Co. will employ about 300 persons. Little mining has been done at the colliery during the last decade.

Utilization

Construction of a pilot plant to make road binder from North Fork Valley, Colo., coal is under consideration. The binder, said to have several advantages over asphalt, was developed recently by Curtiss-Wright Corp.

William Bear, a Somerset, Colo., coal operator, told the Delta County Chamber of Commerce recently that Curtiss-Wright Corp. had indicated a willingness to operate the facility if the Colorado Dept. of Highways would construct the plant. Western Colorado coal was described by Mr. Bear as being ideal for the process due to low moisture content and high volatility.

What is described as the largest steam generating plant in the United States, to burn North Dakota lignite, was unveiled to the public at Fergus Falls, Minn., Nov. 20.

Built by Otter Tail Power Co. as an addition to its Hoot Lake Station, the \$11 million plant will use more than 1,000 tons of lignite a day. More than 5 yr of planning and 2 yr of construction went into the 53,500-kw plant.

The government will save several thousand dollars annually by burning coal in the power plant of the new Federal prison at Crab Orchard, Ill.

Cost figures were submitted by the NCA's engineering Dept., and after an analysis, Charles Kelly, chief architect for the Bureau of Prisons, said construction plans would be drawn to include a coal-burning power plant.

Research for use of western coals will be carried on at the University of Wyoming this year under a \$20,690 grant from the Union Pacific R.R. Foundation.

Dr. H. G. Fisk, director of the university's natural resources research institute, said the goal of the program is to determine if a synthetic coke can be made by carbonization of western coals. Dr. Fisk noted that the institute previously has

conducted experiments along this line, but has lacked the necessary funds to continue. There is a suitable market for a coke substitute, particularly in areas where the cost of coke is high due to transportation costs, he added.

New automatic anthracite equipment is reportedly winning wide acceptance by architects and engineers for new plants and buildings throughout the northeastern seaboard.

Sales of this equipment have increased more than 300% in the last three years and are steadily rising. For example, the

Post Office Dept. has installed about 100 new anthracite units, not only in Pennsylvania but in areas far removed from the anthracite region, in its continuing modernization and building program.

The National Coal Association and other interested coal groups have filed a petition with the Canadian National Energy Board seeking the right to intervene in hearings which begin in Ottawa in early January on several license applications to export natural gas into the United States.

The #1

STAMLER

WINS in

Choice in

EVERY TEST

- Dependability
- Low Maintenance
- Long Life

Where mining men have made comparative tests of STAMLER Car Spotters with other equipment, the preference is invariably for STAMLERS.

This wide-spread acceptance is indicated by the repeat orders for STAMLERS. The performance of one STAMLER unit leads to the use of additional STAMLER units as they are needed. *Once a STAMLER user, always a STAMLER user.*

THERE'S A REASON. Cost-conscious mining men know that for operating dependability, low maintenance cost and long life, there is no unit made which compares favorably with STAMLERS. As the result — STAMLER has 50% MORE units in use than any other make!



W. R. STAMLER CORPORATION
PARIS, KENTUCKY

STAMLERS will cut costs and increase production in YOUR mines, too. Let us give you the facts. Write today.

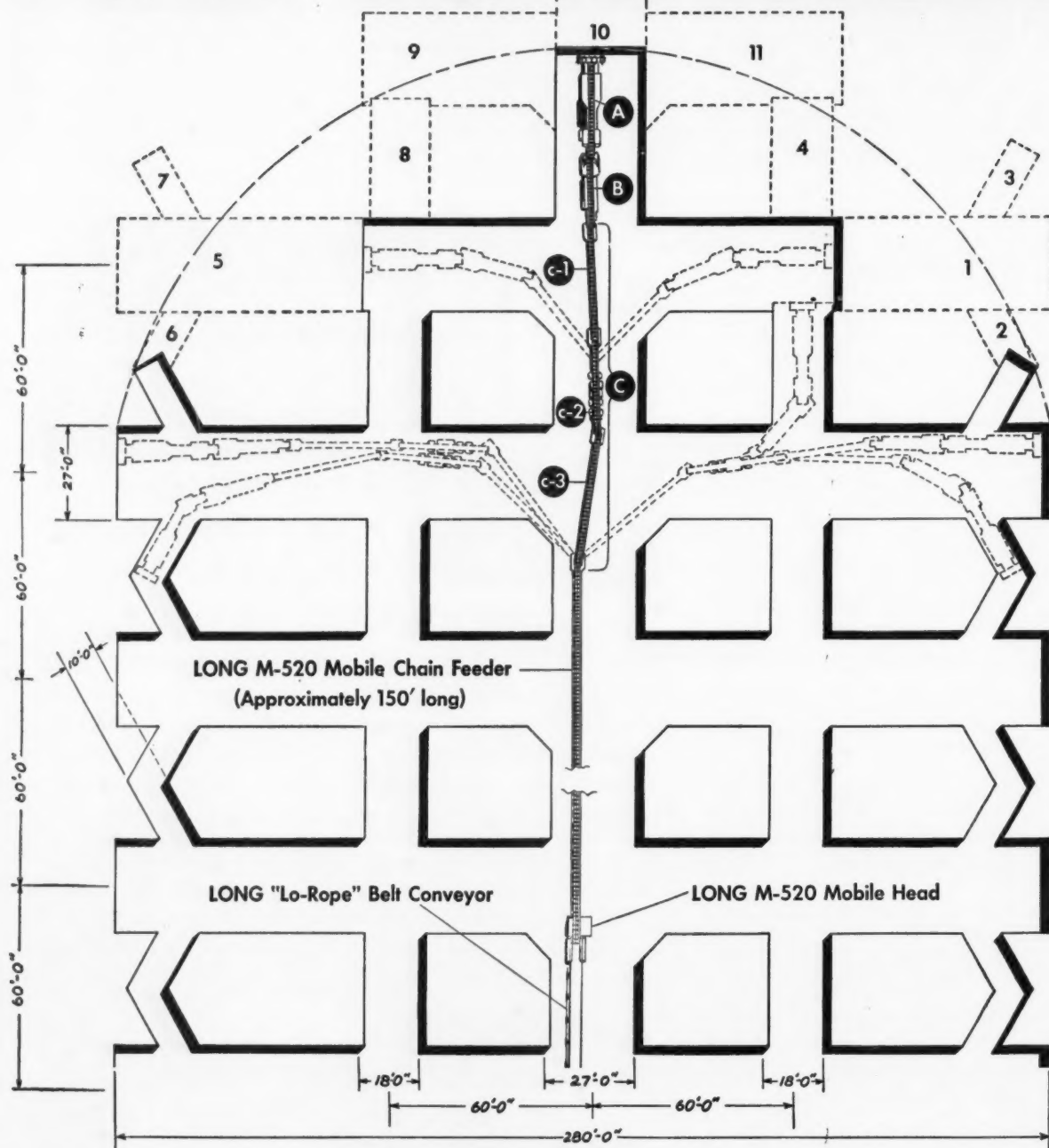
SCHROEDER BROTHERS, Exclusive Eastern Sales Agent
Pittsburgh, Pennsylvania

UNION INDUSTRIAL CORP., Carlsbad, New Mexico

SALMON & CO., Birmingham, Alabama

WESTERN SALES ENGINEERING CO., Salt Lake City, Utah

LONG INTRODUCES ... "FULL DIMENSION"



Coal is mined by a continuous mining machine followed by a LONG 188 Loader. Behind the loader is the three-unit mobile bridge, which feeds on a mobile chain feeder approximately 100-150 feet long. Coal is moved from the mobile chain feeder to a LONG "LO-ROPE" Belt Conveyor, which may be driven by a mobile crawler mounted head section and which is equipped with a "HY-WINDER" belt winding station.

Extensibility of the "FULL DIMENSION" Conveyor System during operation is provided by the movement of the second Piggyback on the mobile chain feeder a distance of up to 150 feet, plus the movement of the first Piggyback on the mobile bridge carrier a distance up to 20 feet. Extensions or retractions of the belt conveyor are made at breakthrough intervals, usually 50 or 60 feet.

Equipment Designation (See Diagram)

Equipment Designation (See Diagram)	Effective Length
A. Continuous Mining Machine	30'0"
B. LONG 188-D Loader	22'0"
C. 3-Unit Mobile Bridge includes:	
c-1 LONG PT-218 Piggyback Conveyor	32'2"
c-2 LONG Mobile Bridge Carrier	25'8"
c-3 LONG PT-218 Piggyback Conveyor	38'8"
Coal Trajectory From Miner (Not shown)	2'0"
Total Effective Length	150' 6"

MINING —THE FIRST AND ONLY

EXTENSIBLE CONVEYOR SYSTEM THAT OFFERS:

- Multiple headings from one conveyor
- Recovery of pillars up to 100 feet wide

The LONG "Full Dimension" Extensible Conveyor System offers higher capacity conveyor mining with all the flexibility of shuttle car haulage. Because of its long articulated

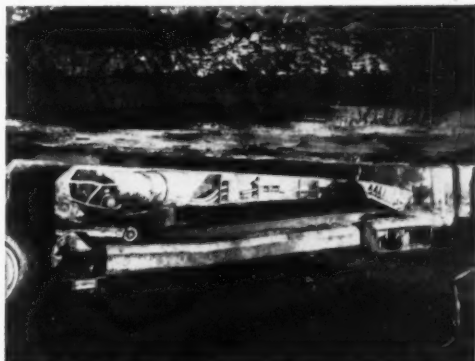
reach and extensibility, this new system can be applied to almost any normal mining plan. The example on the opposite page is but one of many which can be used practicably.

Advantages of "FULL DIMENSION" MINING which have been demonstrated in many months of development and experimental use include:

- Continuous three-shift operation with virtually no delays for transportation.
- 67% increase in production per face man over a six-month period.
- Belt extensions are made, using the exclusive "HY-WINDER", at 60-foot intervals in approximately 15 minutes.
- Each extension (in 48" coal) permits the mining of 1500 tons with no delays except for repositioning the continuous mining machine.
- Deeper rooms and/or fewer belt moves with practical room transportation distance of 1000 feet or more.
- Dramatically improved housekeeping on the section with no constant movement of mobile machinery.
- Improved ventilation and safety because permanent stoppings are carried closer to the face with only the last open breakthrough being used for production haulage.
- Maximum crew cooperation resulting from the elimination of lifting, dragging, dodging, etc.
- Greater efficiency as there is more concentration of activity in a single working face for longer periods of time.
- Important safety advantages in improved roof support result from not having to keep open multiple haulways beyond the last open breakthrough.
- No wait whatsoever for transportation (except the 15 minutes required at each 1500 ton interval).



The "HY-WINDER" provides mechanical assistance in extending or retracting the belt conveyor. An extension requiring 15 minutes provides reach sufficient to mine over 1500 tons. (See diagram at left.)



The three-unit mobile bridge, an exclusive LONG development, is highly mobile and maneuverable. It provides articulated reach up to 150 feet during full continuous conveyor operation.

Write for details or
a demonstration

The

LONG

Oak Hill, W. Va.

Company

New Books

Metal Repair

Arc Welding Manual is a textbook-type publication that offers a comprehensive course in the fundamentals of metal repair. The 43 chapters are organized to present instructions, practical working tips, exercises that can be performed as self-teaching aids, and questions and answers. 210 pp. 6x9-in; spiral bound. \$2.50, *Forney Arc Welders*, Box 563, Fort Collins, Colo.

Coal Analysis

Evaluation of an Acid-Extraction Method of Determining Mineral Matter in American Coals, by E. C. Tarpley and W. H. Ode. A new German technique for determining the mineral content of coal can be applied, with slight modifications, to all American coals from anthracite to lignite, according to the Bureau of Mines. The investigation also indicated that the German procedure probably gives a truer indication of the amount of mineral matter in a coal than can be obtained with the empirical

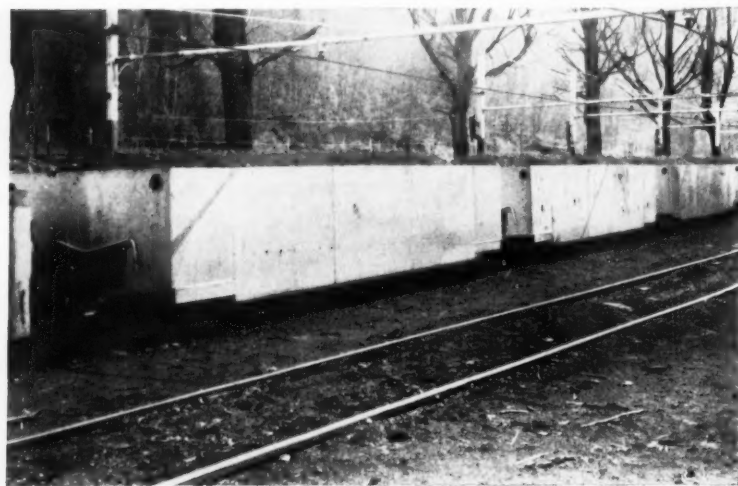
formula method. Details of the technique and tests conducted in evaluating it are included in the report. R. I. 5470. *Publications-Distribution Section, Bureau of Mines*, 4800 Forbes Ave., Pittsburgh 13, Pa.

Plant Maintenance

Techniques of Plant Maintenance and Engineering is a report of the 10th National Plant Maintenance and Engineering Conference. It includes not only the prepared papers but also the informal discussions and contributions from the floor. The volume covers a broad range of subjects from the overall organization of the plant engineering and maintenance functions to such newer developments as controlled machine tools and nuclear plants. Some of the topics of particular interest to mining men include the following: industrial engineering in maintenance, maintenance materials, economical use of electrical power, arc welding in maintenance, and training fundamentals. 266 pp. 8½x11½-in; cloth. \$10, *Clapp & Poliak, Inc.*, 341 Madison Ave., New York 17, N.Y.

Selling Safety

Showmanship in Safety tells how to inject fun, color and showmanship into your industrial safety program. This all-new second edition contains ideas for stunts, demonstrations and promotions designed to help build interest and create favorable attitudes among workers. 96 pp. *National Safety Council*, 425 N. Michigan Ave., Chicago 11, Ill.



haulage capacity...

Place Pocahontas Field

Operator Name on request

Car Dimensions Length: 21' 6" (body)
Width: 7'
Height: 48" (above rails)
Weight: 8600 lbs. (empty)

Capacity 500 cu. ft. (level load)
585 cu. ft. (crown load)

where can you match it?

Since 1915 —
Pioneers in
haulage equipment



Meetings

American Institute of Mining, Metallurgical & Petroleum Engineers, Inc., annual meeting, Feb. 14-18, 1960 — New York, N. Y.

The Institution of Mining & Metallurgy, International Mineral Processing Congress, April 6-9—London, Eng.

Charbonnages de France, International Conference on Strata Control, May 16-20, 1960. Presentation of results obtained from laboratory experiments and underground measurements and observations—Paris, France.

Appalachian Underground Corrosion Short Course, June 1-3, 1960. Fifty-seven classes, 15 new papers and 25 new speakers—West Virginia University, Morgantown, W. Va.

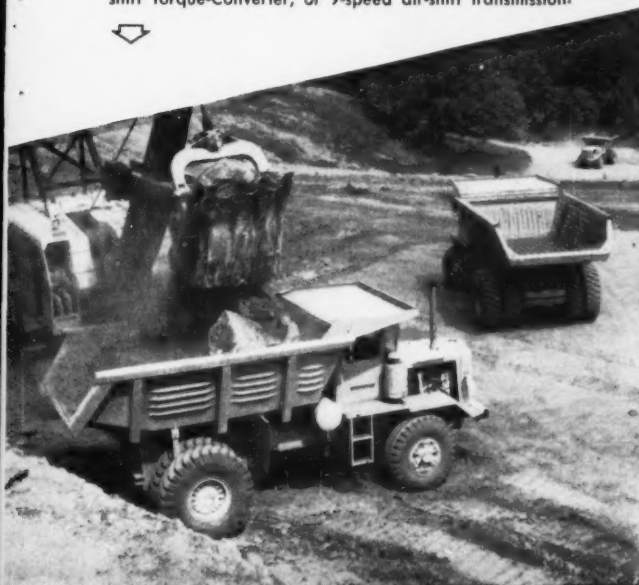
To the reader . . .

The *Coal Age* editors wish you a happy, healthy and prosperous 1960.



Now "trade" dead weight for payload..and haul 40% faster!

Heap-load the big-target Payhauler body in minimum time. Strong rock-ribbed corrugations absorb shock—resist wear and distortion. Choose the "95" with power-shift Torque-Converter, or 9-speed air-shift transmission.



New strength-multiplying corrugated body design results in payload-gaining weight reduction of both International Payhauler models. New "95" capacity is increased to 27 tons—and the new "65" becomes the only 19-tonner on the market!

Look at those exclusive, rock-ribbed body corrugations! International applies this strength-multiplying principle to reduce Payhauler® body weight by an amazing 30%! You "trade" $2\frac{1}{2}$ tons of power-wasting dead weight for 3 bonus tons of payload capacity in the new 95 Payhauler!

New high-torque, high-output diesel power highballs 27-ton payloads up to 40% faster than the former "95" could haul only 24 tons! The new 375 hp DT-817 International diesel engine gives the new 95 Payhauler the wallop of 40 extra turbocharged "horses."

Prove to yourself that top load-carrying capacity plus top power-to-weight ratio give 95 Payhaulers tremendous profit-earning advantages. Add up other big Payhauler exclusives: fast reverse, up to 7.1 mph. for spotting speed; big-target bodies for loading zip; 11-second inverted-hoist dumping; load speeding safety of torqmatic braking and positive power-steering! Let your International Construction Equipment Distributor demonstrate!



**International[®]
Construction
Equipment**

International Harvester Co., 180 N. Michigan Ave., Chicago 1

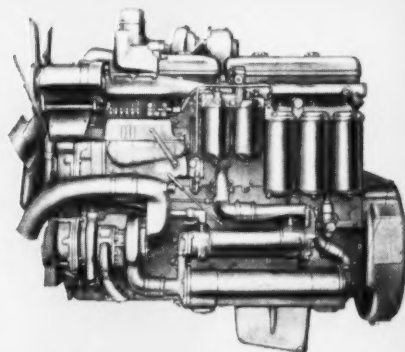
A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers and Bottom-Dump Wagons... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

Planet power steering with

gives new 230-hp TD-25 class-topping



Here's the new direct-start 6-cylinder turbocharged International DT-817 diesel that powers the TD-25. Dual valving of this high-torque 230-hp power plant provides for peak turbocharging efficiency, for full power delivery from sea level to timberline!



built-in power-shifting

capacity!

You get combined Planet Power-steering and Hi-Lo on-the-go power shifting exclusively in the new International TD-25 crawler. As standard equipment at no extra cost, the TD-25 gives you the International-developed control combination that has been beating the daylights out of king-sized clutch-steered crawlers for years!

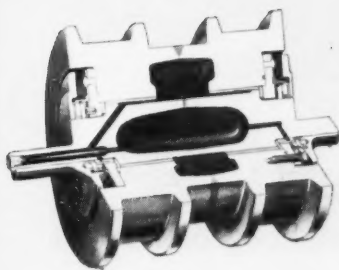
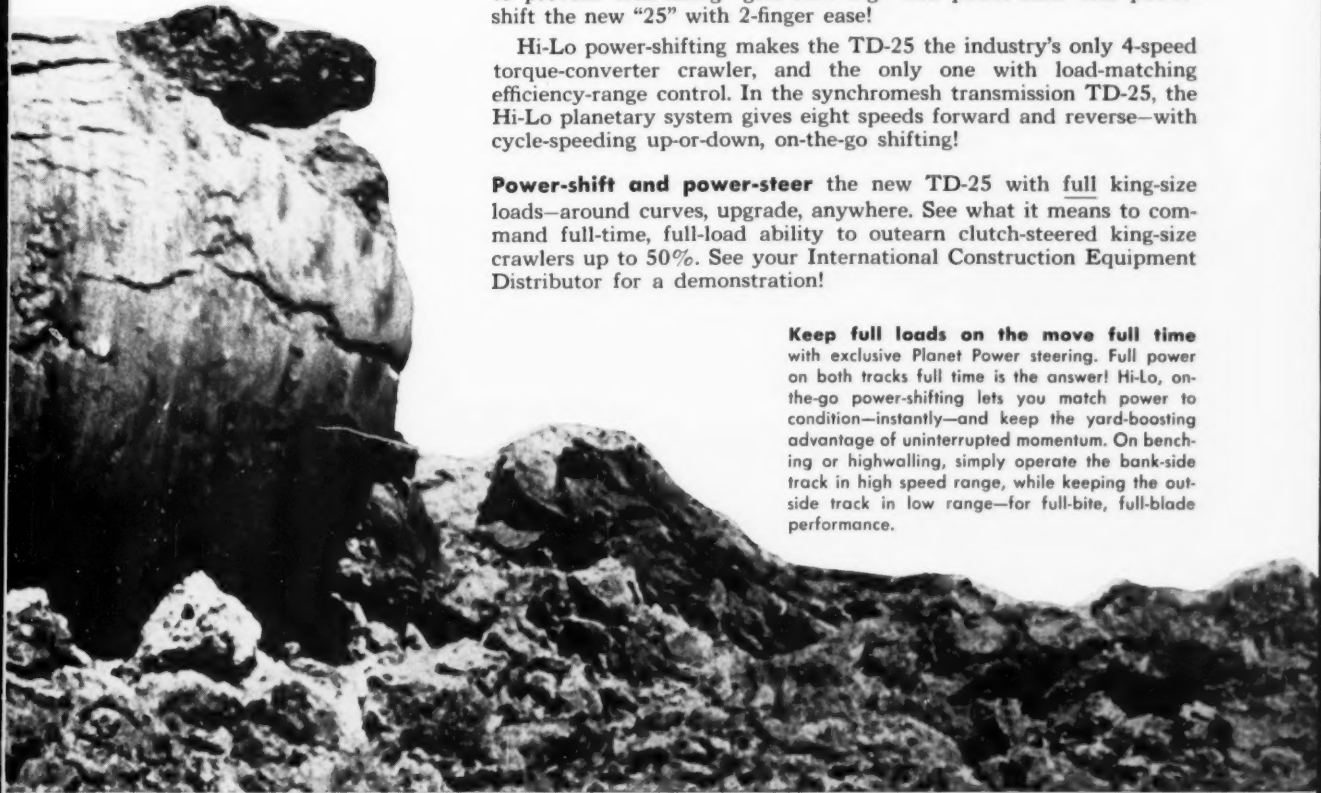
With this and all its other big advantages, the TD-25 can outearn other big rigs up to 50%—on highwalling, benching and side-casting, as well as on straight dozing to remove overburden, or to harvest minerals or building materials!

No "dead-track drag" or "gear-shift lag"! Planet Power steering gives you full-time "live" power and traction on both tracks to make full-load turns—and eliminate load-limiting dead-track drag. And Hi-Lo on-the-go power shifting instantly matches power to condition to prevent load-losing "gear-shift lag." You power-steer and power-shift the new "25" with 2-finger ease!

Hi-Lo power-shifting makes the TD-25 the industry's only 4-speed torque-converter crawler, and the only one with load-matching efficiency-range control. In the synchromesh transmission TD-25, the Hi-Lo planetary system gives eight speeds forward and reverse—with cycle-speeding up-or-down, on-the-go shifting!

Power-shift and power-steer the new TD-25 with full king-size loads—around curves, upgrade, anywhere. See what it means to command full-time, full-load ability to outearn clutch-steered king-size crawlers up to 50%. See your International Construction Equipment Distributor for a demonstration!

Keep full loads on the move full time with exclusive Planet Power steering. Full power on both tracks full time is the answer! Hi-Lo, on-the-go power-shifting lets you match power to condition—instantly—and keep the yard-boosting advantage of uninterrupted momentum. On benching or highwalling, simply operate the bank-side track in high speed range, while keeping the outside track in low range—for full-bite, full-blade performance.



Thickest-shelled roller design in the crawler industry—with king-size lube reservoirs and seal-protecting pressure-relief passages—combine to make TD-25 Dura Rollers the ones you can power-lubricate without affecting seal life or efficiency!

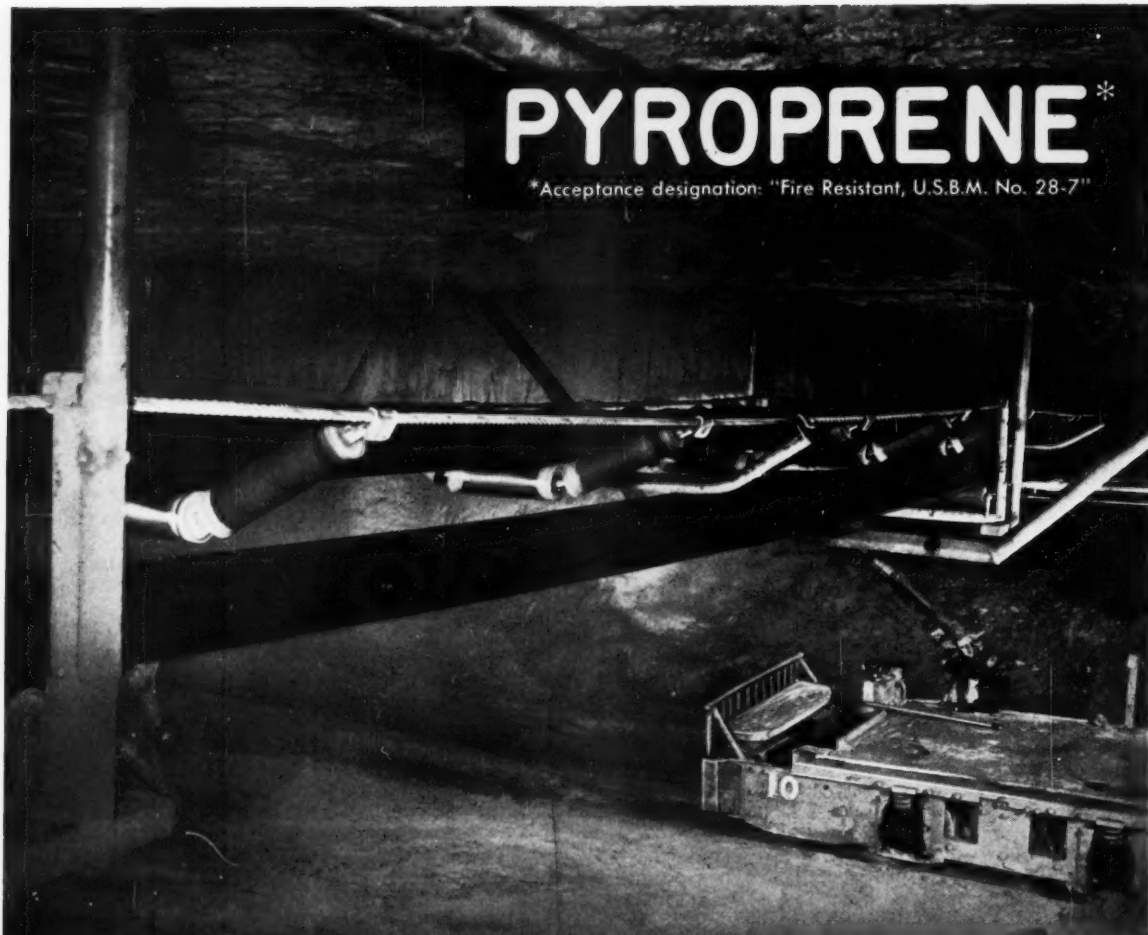


International Construction Equipment

International Harvester Co., 180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers and Bottom Dump Wagons... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

PYROPRENE*

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"



Here's one overhead that runs up big profits

This Acme-Hamilton 48-in. conveyor belt, on a Goodman Rope-belt Conveyor is carrying coal at 1500 tph with low maintenance costs and long service life. Note how nicely the belt troughs under the bulky load—and how flat it runs between the return idlers... sure signs of excellent construction and fine quality.

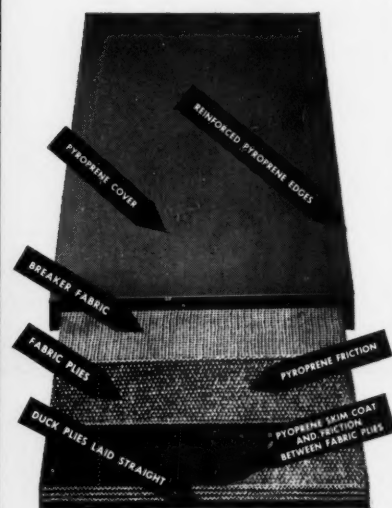
PYROPRENE PROTECTED against fire, Acme-Hamilton U.S.B.M. accepted belts will not feed or spread fire. The cover is fire-resistant Pyroprene; fabric plies and breaker fabric are encased with Pyroprene compound before the belt is built. Cover has exceptional resistance to abrasion and cutting. Write Acme-Hamilton Dept. CA-91.

Acme  **Hamilton**

MANUFACTURING CORPORATION, TRENTON 3, N. J.

Divisions: Acme Rubber Mfg. Co. • Hamilton Rubber Mfg. Corp.

ATLANTA • CHICAGO • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES
MILWAUKEE • NEW YORK • PITTSBURGH • SALT LAKE CITY • SAN FRANCISCO • SEATTLE





JANUARY, 1960

IVAN A. GIVEN, EDITOR

Comeback in 1960

Production of around 7 million autos and of 1¼ million trucks in 1960 is being prophesied by a growing number of forecasters, subject to the absence of any disaster, such as the steel strike of 1959. An auto year of 7 million, second best in history, inevitably means a good year for all manufacturing and allied industries and those that serve them—steel, power and so on. Foregone conclusion: A year of significant increase in the output of bituminous coal—and of an improved climate for anthracite.

Electric power, which might be said to have saved coal's shirt in 1959, will stage another advance in 1960, with corresponding upward climb in coal consumption. Steel will come in with a major increase in requirements, general industry should tend to increase its takings, and there should be additions to stocks. On the loss side there will be a further drop in the domestic market and overseas exports remain a question. But the possible losses are relatively minor, while the gains in 1960 will be written in big figures.

Weighing everything, there is good reason to anticipate a bituminous output of 440 to 450 million tons or more in 1960, adding some \$150 to \$200 million to industry income. After a couple of lean years, the extra cash will be doubly welcome, but its arrival does not, of itself, mean the automatic disappearance of problems. However, extra money to play with does make it easier to achieve additional progress in the solution or alleviation of problems, all the important ones of which arise out of outside competition in the fuel and energy market.

Competition will still be around in 1960, and it will still be tough and aggressive. But it should not be any tougher or more aggressive than in the recent past, while coal's cost advantage, helped in its mainstay capacity by freight reductions into key markets, undoubtedly will increase again in 1960. No new competitor is likely to appear to give coal trouble in 1960—or for a number of years beyond for that matter. Coal therefore is left free to wrestle with the competitors it has long been encountering in the marketplace—and which it is becoming more and more skilled in meeting as a result of long and hard experience.

Though competition is still around—and will be for the indefinite future—coal can bank on a continued rise in output for still more help in meeting it. That is one of the outstanding aspects of its present situation. The big losses have been taken, no likely new competitors are in view, the markets where coal is solid are destined for steady and significant growth, and new markets of a major character are a distinct possibility. Problems there always have been and problems there always will be, but coal will continue to progress in solving them and thus accelerate its growth in the comeback era ahead.

The Lewis Era . . .

1920-1960 in Coal

UMW beginnings . . . The early days of Lewis . . . Accession to power and union collapse . . . Rebirth in the 30s . . . The turbulent 40s and tranquil 50s . . . Ahead for coal and union

Ivan A. Given
Editor, Coal Age

AS DID HIS ACCESSION TO POWER, the decision of John Llewellyn Lewis, Local 746, Springfield, Ill., to give up, a little later this year, the presidency of the International Union, United Mine Workers of America, comes at the end of one significant era and the beginning of another in coal.

At the time Lewis took over the union helm in 1919, a year before he was officially elected president in 1920, coal was a hand-loading industry. Few had faith in the possibilities of the machine and fewer still were working on the idea. Second, oil, pushed by the government in World War I as a substitute, was just starting to give competition to coal. But that start was signalling the end of an era during which bituminous tonnage roughly doubled every 10 yr, with a corresponding growth rate for anthracite.

As Lewis gives up the reins, bituminous is looking forward, after 40 yr, to a new growth era, and in addition is on the threshold of a production future that will be marked by the ultimate in automated operation.

The intervening 40 yr have been marked, among other things, by these developments:

A prolonged struggle against growing competition, not only from oil but hydroelectric power and natural gas, with nuclear fission as the newest recruit. This period has been marked by the complete loss of the railroad market—140 million tons at

its peak—and a sharp curtailment in the home-fuel market. As a result, average bituminous tonnage today is approximately 50 million less than the average 40 yr ago, while anthracite is only a fifth of its alltime peak registered in 1917. But coal has refused to be counted out and bituminous has emerged as the premier heavy fuel, with the result that it now looks forward to steady and significant growth.

An unceasing campaign to cut cost and raise product quality, reflected in the fact that tons per man day in bituminous is now over 12, more than three times the 4 of 1920, and anthracite over 4 against 2.28 in 40 yr ago. The rise in machine production underground and stripping on the surface—both almost unknown in 1920—were the big factors. This increase in productivity is a major reason—losses to competition being the minor one—for a reduction in total employees in bituminous from 640,000 in 1920 to probably 175,000 in 1960. In anthracite, in contrast, losses to competition have far outweighed increases in productivity in cutting workers from 145,000 in 1920 to under 25,000 in 1960.

Entrance of the federal government into the labor-relations field on the side of the unions in the early 30s, which put the almost defunct union—and Mr. Lewis—back in business after the disastrous liquidation period following World War I and the Jacksonville agreement. As far apart as the poles in the early years of Lewis' regime, the union and the operators, though still not exactly buddy-buddy, now have attained

what might be called a state of partnership in limited areas and general cooperation in some others.

Early Lewis Days

The future head of the United Mine Workers was born to Thomas H. and Ann Louisa (Watkins) Lewis, at Lucas, Iowa, Feb. 12, 1880.

There were six Lewis brothers, including John, and two Lewis sisters. Most of the brothers found careers in the United Mine Workers. One exception was Howard, who elected to go to the management side and had advanced to the vice presidency of the Old Ben Coal Corp. when he retired in 1958. Present connections of the other surviving brothers (Thomas A. and George W. are deceased) are:

A. D. ("Denny") Lewis, president of Dist. 50.

Raymond O. Lewis, the youngest, president of Dist. 17.

Money was scarce and so the Lewis children, including John L., had to forego more than the bare minimum of schooling in favor of income-producing employment. At twelve, he took employment as a mule driver—a job in which boys were quite prominent in those early days. For a time he became a drifter, holding down jobs in coal and metal mines in Mexico and Canada as well as the U.S. But he eventually returned to the Middle West and coal, becoming, after a tour of duty in Iowa, a member of the Panama local in Illinois, thus earning that local, even though it has been gone these many years, an undying place in the history of the industry, in addition to making it, for many years, one

of the most-difficult of all locals to deal with.

Lewis, on June 5, 1907, wed Myrta Edith Bell—possibly another case of the attraction of opposites. She was a school teacher and in her quiet, modest way, was outstanding among women until her death in 1942, and is reputed to have been of much-more-than-ordinary help to her husband in his career. Two children were born to the union—Kathryn, prominent in Dist. 50 in its early days and now assistant to the president, and John L. Jr., a Johns Hopkins graduate with a surgical practice in Baltimore.

Lewis was not born to be a working stiff all his life and so he early became active in union affairs and was rewarded by being elected delegate to the national conventions, the first time representing an Iowa local in 1906. In 1910 he first attracted more than local notice by an attempt—unsuccessful—to get the floor in the session. However, he became legislative agent for UMW Dist. 12 in that year, and having caught the eye of Samuel Gompers, was appointed a representative of the American Federation of Labor in 1911.

In 1914, when Gompers, the cigarmaker, was trying to smooth over one of the perennial collisions between the AFL and the UMW, Lewis was assigned as his special aide during the convention. In 1916 he moved up another notch—to the chairmanship of the all-important resolutions committee. In 1917 he was named union statistician, a post held a short time previously by William Green, who later became head of the federation and a Lewis target in Taft-Hartley days. In 1917 President Frank J. Hayes made Lewis manager of the *United Mine Workers Journal* and union vice president at \$2,500 a year. In 1919, he presided, in the absence of Hayes for health reasons, over the special international convention in Cleveland, Sept. 19, 1919. In 1920, he was formally elected ninth president of the union at a salary of \$5,000 a year.

Early Union Days

The United Mine Workers of today is the outgrowth of a movement dating back to the Bates union of 1849, organized by John Bates in the anthracite region. In 1861, as a

result of campaigning by Thomas Lloyd and Daniel Weaver, of Illinois, the American Miners' Association came into being. In 1864 a rival arose in the anthracite region in the form of the Workingmen's Benevolent Association, headed by John Siney.

Siney, responsible for the first anthracite industry wage agreement, in 1870, was an organizer of note, and as a result of his operations the Miners' National Association of the United States of America was formed in 1873. It bit the dust, a panic victim, in 1876. But the Knights of Labor had become active, as well as individual miners and local groups. These latter, in 1883, organized the Amalgamated Association of Miners of the United States. After a short but disastrous career, it was succeeded by the National Federation of Miners and Mine Laborers in 1885.



Wide World

A bitter battle with the Knights resulted in their withdrawal in 1888 and a change in name to the National Progressive Union of Miners and Mine Laborers, which decided to affiliate with the AFL. A house divided proved intolerable, however, and on Jan. 25, 1890, both groups joined to form the United Mine Workers of America. The preamble to the constitution then adopted reads as follows:

"There is no fact more generally known, nor more widely believed, than that without coal there would not have been any such grand achievements, privileges and bless-

ing as those which characterize the nineteenth century civilization, and believing, as we do, that those whose lot it is to daily toil in the recesses of the earth, mining and putting out this coal which makes these blessings possible, are entitled to a fair and equitable share of the same. Therefore, we have formed 'The United Mine Workers' of America, for the purpose of the more readily securing the objects sought, by educating all mine workers in America to realize the necessity of unity of action and purpose, in demanding and securing by lawful means the just fruits of our toil."

Eleven specific objectives were listed in the original preamble, the eleventh being:

"To use all honorable means to maintain peace between ourselves and employers; adjusting all differences as far as possible, by arbitration and conciliation, that strikes may become unnecessary."

At the time of its organization, the union represented 25,000 men, or about one-thirteenth of the 318,000 men employed; including 128,000 in anthracite. Initiation was 50c to \$1 and dues were fixed at 20c per month per member.

The Lewis Reign Starts

By the time Lewis achieved the presidency in 1920, the United Mine Workers had grown to the point where, as of Aug. 1, 1919, it could claim a total membership of 434,987, of which 391,339 paid dues. The treasury on that date held \$1,728,906.12. Total employment in the anthracite industry in 1919 was 154,571, and in bituminous, 621,998. Thus the union could claim a little over half the total number of workers, primarily in anthracite, and in Pennsylvania bituminous, Ohio, Indiana, Illinois, Iowa and areas farther to the southwest and west. Little headway had been made in West Virginia, Kentucky, Virginia, Tennessee and Alabama.

This rise had not been accomplished easily, reflecting an almost complete inability over the years to reach any basis of understanding. This flowed out of the fact that owners and managers found themselves unable to accept any interference with what they felt were their traditional rights to buy labor at what they considered

a right price with no interference from anyone.

But there was an occasional breach in the wall, largely the outgrowth of common economic necessity. The joint call for the first interstate conference in 1886, as an example, included this language:

"It is also equally true that the widespread depression of business, the overproduction of coal, and the consequent severe competition have caused the capital invested in mines to yield little or no profitable returns. The constant reductions of wages that have lately taken place have afforded no relief to capital, and, indeed have but tended to increase its embarrassments. Any reduction in labor in any coal field usually necessitates and generates a corresponding reduction in every other competitive coal field. If the price of labor in the United States was uniformly raised to the standard of 3 yr ago, the employers of labor would occupy toward each other the same relative position in point of competition as at present. Such an advance would prove beneficial to their interests, as it would materially help to remove the present general discontent of the miners in their employment."

The objective, in other words, was stability in what is still the biggest item in costs—wages—even then recognized as a major consideration in corporate and industry progress, as well as in miner welfare.

But the exceptions to the pervading hostility and conflict were very much the exceptions, and eliminating or alleviating them was still the biggest union—and industry—problem when Lewis took over.

Man and Job

Along with the complete lack of progress in attaining common ground with management, the United Mine Workers, along with the industry, was faced, at the time Lewis came to power, with the problems of overcapacity brought about by wartime excesses. In addition, though it probably was not too apparent at the time, oil was beginning the campaign that was to bring coal a burden of grief equal to or greater than that of overcapacity.

Lewis brought to the new job a great deal of skill born of participation in the many and often no-holds-

barred battles within the union, as well as his service as an organizer and legislative representative. But perhaps his principal assets were these:

Outstanding ability.

The utmost in tenacity.

A willingness to set himself a pace far beyond that the average man can stand.

As much iron in his makeup as any man in history, enabling him to turn the screw down to the last thread and withstand incredible pressures in so doing—pressures far beyond the capacity of the common mortal.

A forensic capability almost unparalleled in history. This he refined, improved upon and sharpened over the years into an instrument both formidable and flexible.

For one involved in so many bitter and tumultuous episodes, Lewis' career is remarkably free of physical encounters. Perhaps the outstanding one of record was the one-punch episode at Atlantic City with William L. Hutcheson, head of the Carpenters, in 1935, preceding the secession of the CIO from the AFL.

Where words were the weapons, the picture was another one entirely. In a growling boom, scalding with scorn and dripping with menace, proceeding forth from a darkly-lowering and craggy visage, the searingly-corrosive verbal assaults mounted by Lewis were often devastating in their impact. Many were strictly for effect, but many also were meant.

But with qualities that might be considered assets Lewis also was inclined toward intemperance — in part, perhaps, because he was Lewis and in part because he occasionally was carried away in his zeal to win his demands. Sometimes intemperance was feigned but sometimes it was real. In fact, shortly after he took over union command, this question of whether he really showed intemperance and if so what it might have cost came up in various forms.

Descent Into Futility

Problem No. 1 when Lewis assumed the presidency was the continued growth in overcapacity, stimulated by wartime demands and carried on to near-suicidal lengths by 1923, when the theoretical 280-day figure reach-

ed 885 million tons—probably 200 to 300 million more than the industry actually would need in the next 15 to 20 yr of swiftly growing oil competition and an equally tonnage-depressing increase in the efficiency of coal use in steel, railroads, general industry and electric power.

Problem No. 2 was the growing nonunion tonnage from the southern fields, which was making life doubly burdensome for the old Central Competitive Field — Pennsylvania, Ohio, Indiana, Illinois and Iowa primarily —which, with the exception of a few small outlying districts and pockets here and there, was about the only bituminous territory the union could really assert jurisdiction over.

The first of several clashes with Presidents of the United States took place in 1919. Failure to renew the Central Competitive agreement resulted in Acting President Lewis calling a strike Nov. 1. Wilson called the pending strike "not only unjustifiable but unlawful" and demanded recall of the strike order. Under the Lever Act the union was enjoined against striking and all its officers were arrested. But Lewis was, as in later years, adamant and Wilson soon yielded, agreeing to an increase and the appointment of a Presidential Commission to permanently settle the issue. However, it took a further stoppage in 1920 to bring Lewis what he really wanted, including another defeat for Wilson—but not contracts for southern fields.

The year 1921 was one of depression, and likewise the next. Refusal of the operators to attend a negotiation meeting in 1922 resulted in a complete shutdown of union mines on April 1 and set the stage for the second of coal's two blackest episodes. The first, "the Ludlow massacre," in Colorado, April 20, 1914, was the culmination of some 3 yr of struggle between union and management. Twenty men, women and children met death at the hands of pickup Colorado National Guard troops triggered into hysteria by some never uncovered fear or incident. The second was "the Herrin massacre," at Herrin, Ill., June 22, 1922.

An attempt by the Southern Illinois Coal Co. to operate a strip mine with non-UMW labor led to the massacre. At least some employees were members of the Steam Shovel Men's Union, which was persona non grata

with the AFL at that time, leading Lewis, on June 19, to this statement at the end of a telegram to State Senator William A. Sneed, president of Dist. 12:

"Representatives of our organization are justified in treating this crowd as an outlaw organization and in viewing its members in the same light as they do any other common strikebreaker."

Union members acted, and in an ensuing death march into and through Herrin an estimated 25 men (the exact number was never really known) were shot, hanged or had their throats cut. No one was ever brought to trial, and the union later bought the mine and equipment, wrecked by dynamite, for \$729,000.

Economic tragedy, too, was about to overtake both miner and operator. The anthracite industry also was closed down April 1, 1922. The strike lasted 162 days, and together with the 170-day strike of 1925-26, dealt hard coal two blows which materially deepened and hastened the decline initiated by the rise in oil competition.

Meanwhile, the bituminous situation was worsening, especially for the Central Competitive Field, making Jacksonville negotiations, which started in February, 1924, a turning point in industry history. But Lewis was successful in getting a new 3-yr contract continuing the previously won \$7.50 scale.

The miners' glee was short-lived. Nonunion competition, oil competition and the general economic situation proved intolerable, and the union was asked to agree to a reduction. Lewis refused, proclaiming "No backward step." The operators rebelled, abrogated the agreement and broke the union. In 1928 defeat was recognized when the union policy committee gave the districts freedom to negotiate "mutually satisfactory" contracts. The union was through except in anthracite, the Middle West and a few outlying districts beyond the Mississippi.

Whether the picture would have been different had Lewis not been born with a tendency toward intemperance no one can truly say. In any event coal experienced one of the severest economic bloodlettings ever survived by any industry. It seems reasonable that a higher degree of economic statesmanship would have

eased the problem of living through this period of growing competition and liquidation of war and postwar overcapacity, and would have limited the descent into red ink in barrels, poverty wages, and galloping bankruptcy.

Roosevelt to the Rescue

With their own personal depression on top of the collapse of 1929 the miners were especially cheered by the promises of Franklin Delano Roosevelt, who entered into his reign in January of 1933. A cardinal key in the depression-busting steps he and his followers generated was "NIRA," the National Industrial Recovery Act, passed in June 1933. One section in that act rescued Lewis from the swamps of futility and put the United Mine Workers back in business. It was 7(a), including the provision that "employees shall have the right to organize and bargain collectively through representatives of their own choosing."

Lewis moved swiftly and the operators, even in areas previously covered by standing injunction, offered no resistance. This was in large part a reflection of their growing realization that some outside means of achieving stabilization was necessary, even a union contract to achieve that end in the important field of wages.

The first Appalachian wage agreement was signed Sept. 21, 1933, with base scales of \$4.60 in the North and 4.20 in the South. It was to be followed by other successes on the negotiation front, but at the same time Lewis was confronted with a few bothersome details from the period of collapse. In that period, incidentally, he had some trouble getting himself returned to office. One election involved the disappearance (still unsolved as far as the record goes) of the Illinois ballots.

The ballot loss was only one aspect of the conflict with Illinois which resulted in Lewis being barred, by injunction, for a lengthy period starting in 1929 from any interference in Dist. 12 affairs. The revolt eventually led to the formation of the Progressive Miners of America in 1932.

One of the Progressive planks was limitation of loading-machine output, which also was the idea of many UMW members. But Lewis, as always throughout his career, battled

this idea and won. In his own book, "The Miners' Fight for American Standards," published in 1925 while the storm clouds were gathering, appears, among others, this passage:

"All agree that fair wages are only possible because of the increased productivity per worker, secured largely by advanced methods and means of production. It is equally true that such wage rates are the principal incentive for the invention and installation of new devices."

As someone has said: "Truer words were never spoke." Lewis rounded out the policy he has consistently followed in arguing against a resolution to limit production at the 1934 convention. Terming any such step "false economic policy," he continued:

"Machines have made possible improvements in the standards of living to the point where it is impossible to scrap the means of advancement. What we must do is see to it that we also share in the benefits wrought by the machines in the form of reduced working time and increased compensation."

The record shows no deviation from this article of faith.

Industrial Unionism

Though there still were a few holdouts, Lewis soon after the first Appalachian agreement could claim better than 90% of the bituminous tonnage, and all of anthracite. In the years between that date and World War II he campaigned for and won, among other things, the following:

1934—The 7-hour day and wage scales of \$5 and \$4.60 a day for bituminous.

1935—Wage scales of \$5.50 and \$5.10 for bituminous.

1937—A 7-hour day for anthracite and \$6 and \$5.60 for bituminous.

1939—A "union-shop" provision for commercial bituminous and anthracite.

But progress on the wage front still left unexorcised the economic devils of competition and overcapacity. In fact their troop was augmented by government-sponsored hydro and natural gas. So the union, with the operators, perforce had to seek other means to try to ease the impact of this competition. NIRA set the stage but even in the 20s union and operator had been actively exploring and

advocating various forms of government help in achieving stabilization.

After NIRA was unhorsed in 1935 in the *Schechter* "sick-chicken" case, union sympathizers in Congress rode up with the Bituminous Coal Act of 1935, promptly emasculated by the Supreme Court in 1936. But the union bloc came back with the Coal Act of 1937, which finally was permitted to expire, with only limited and perfunctory mourning, in 1943.

Anthracite was especially vulnerable to oil, and one reflection of its effects was the rise in "bootlegging." Anthracite adopted a price-stabilization plan in 1935, and finally went to voluntary allocation of production in 1940, legalized by the Pennsylvania legislature in 1941.

Though there were minor troubles at home, Lewis had his eye on other fields in line with his long-held dream, and also that of the union, for the development of industrial unions for the mass-production industries. This dream, incidentally, had already embroiled Lewis and the union with the predominately craft AFL on several occasions.

Lewis also had moved headquarters to Washington and had adopted the Democratic party. But like many others he was soon to find out that governments, princes and politicians are notoriously fickle. He demanded political repayment from Roosevelt and was rebuffed, leading to his famous 1940 declaration that:

"It ill behooves one who has supped at labor's table and who has been sheltered in labor's house to curse with equal fervor and fine impartiality both labor and its adversaries when they become locked in deadly embrace."

What led up to this was a break with the AFL in 1935 over proposals to organize mass-production industries, followed by the formation of the Committee for Industrial Organization. Among other things, this committee, with help from the flat-out abdication by state and local authorities of their traditional responsibilities for protecting property and personal freedom, put the "sit-down" strike into the labor-relations picture. Its operations in organizing steel, resulting in Roosevelt refusing a call for help, resulted in the Lewis blast.

The name was changed to the Congress of Industrial Organization in 1938, and Lewis decided to back

Wilkie in 1940, promising to resign as CIO head if he lost. Wilkie did and Lewis did.

The Turbulent Forties

Board, department and President-busting featured the Lewis operations in the 40s. Only Judge Goldsborough proved to be his match. Things started off with a new bituminous contract providing for a \$7 scale in both North and South, eliminating a historic differential and helping setting up a situation that is still troublesome today. Then Lewis brought a sudden end to the National Defense Mediation Board by defying its order to cease trying for a "union shop" from the captives. The dispute went to Roosevelt, who said: "The government of the United States will not order, nor will Congress pass legislation ordering, a closed shop."

They were hollow words. A panel of three, with John R. Steelman, who resigned his government job specifically for the purpose, as the "public" member, gave Lewis his victory.

This was more or less the pattern—defiance and a face-saving abdication formula—for the war and post-war years that followed up to 1946. In that period, the industry was partially or completely seized four times—first in 1943, and last in 1946, this latter lasting 13 mo. Aside from wage increases to \$11.85 a day, other concessions won by Lewis in this period included:

1941—Vacation with pay—\$20 the first time.

1943—Portal-to-portal pay.

1946—A welfare fund, starting at 5c per ton; mandatory compliance with USBM safety regulations; unrestricted power of safety committees to remove men from dangerous areas.

The 1946 seizure set the stage for one of the very-few Lewis defeats. He attempted to terminate the Krug-Lewis agreement and was ordered by the court not to. He remained silent and on Nov. 21 the miners walked out. On Dec. 4 Judge Goldsborough fined the union \$3.5 million and Lewis \$10,000. On appeal the fines were upheld but the union's was cut to \$700,000. Disagreement among the welfare-fund trustees precipitated a strike in 1948, followed by an injunction with no effect. As a result the union was fined \$1,400,000 and Lewis \$20,000.

The federal mine safety code was written into the 1947 bituminous contract, which also included the "able and willing" clause. The safety code had previously been drawn up under the terms of the Krug-Lewis agreement, and was a significant step forward in response to pressure by the union from the time of its formation for stiffer laws and regulations. The Centralia explosion, in March, 1947, had moved Congress to pass a mine-inspection bill later in the year without police powers. The Orient explosion, Dec. 24, 1951, resulted in a new act in 1952 giving the government specific powers to close properties to prevent disasters.

The passage of these acts, the safety code, better state legislation, and more operator and union organization, with stepped-up efforts by the USBM accelerated the long-continued decline in fatality and injury rates, though coal still is a long way from the ultimate.

The year 1947 brought another increase in wage rates from \$11.85 to \$13.05, while the welfare assessment was raised to 10c. At the end of the year, Lewis, who had gone back after a split with the CIO, took the UMW out of the AFL as a result of different attitudes toward Taft-Hartley. In 1948, wages were raised to \$14.05 and the welfare assessment to 20c. This was only a curtain-raiser for a prolonged period of "memorial," "stabilizing," "no welfare—no work" "3-day-week" and "no-day-week" stoppages in 1949, followed by an agreement in 1950 upping wages to \$14.75 and welfare to 30c. The "able-and-willing" clause was banished.

The Tranquil Fifties

A change in bargaining setup—and perhaps more significant, a change, in attitude on both sides—was to make the 50s as tranquil as the 40s were turbulent. This change was presaged in operator response to a *Coal Age* study of ways and means of improving relations (April, 1949, p 75). A better negotiating setup and better liaison with the union were overwhelmingly approved. One result of this change in thinking was the organization of the Bituminous Coal Operators' Association, followed by a prolonged era of agreement without strikes.

Under this new setup wages have been steadily advanced to their present base of \$24.25, compared to \$2.50 to \$3 in the days when Lewis took over. The two-step system—\$1.20 first and then 80c was inaugurated in 1956. Previously, in 1952, the welfare-fund assessment was upped to 40c. The vacation pay is now \$200.

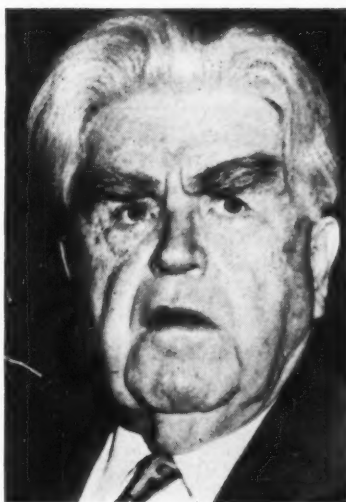
So the 50s have been for the most part tranquil. With this tranquility—though some have compared it to a bear being led around by the nose by his trainer—Lewis has moved to actual partnership with coal, railroad and allied interests through joint ownership of American Coal Shipping, Inc., organized in 1956. In 1958 a new land was pioneered when he was invited to speak before the American Mining Congress—and talked very much like an operator. Broadening his cooperation and participation—and perhaps forecasting further joint action in other directions in the future, his union is among the founders of the National Coal Policy Association.

But those little economic devils still hang around and one of the holes in an otherwise rather perfect tapestry is the conflict in eastern Kentucky, which, with its inherently higher-cost mines, was harder hit by the last increase than most other areas.

And the steadily rising level of wages has stimulated the rebirth and growth of nonunion tonnage in spite of the efforts of the union and contract signatories to stamp it out, with the result that now, compared to the 30s, the nonunion percentage is 20 to 25, against 5 to 10% then. But there is no serious challenge to the idea of contract mining, because, as long ago noted, it is the surest way, despite its drawbacks, of stabilizing what still is the major item in cost, in turn stabilizing prices and enabling the industry to do a better job in the marketplace.

And Ahead . . .

On balance, the long sharp needle with the red-hot tip, or, depending on how you want to look at it, the naked bludgeon, which Lewis has wielded with right good will down through the years, has helped because it has forced coal-mine management to step out, modernize and stay ahead to keep up with the drumfire of wage increases and other de-



Wide World

mands. And he has also helped—to a considerable extent at least—by fostering increased productivity per man, with an assist from the operators in the form of major outlays for machinery to make it possible for the miners to achieve the increase. And he has further helped, in money, in partnership and in influence and cooperation, in certain other directions as well. Consequently, though the process has been painful and an occasional burden on progress, coal today undoubtedly is in a better position—leaned down, efficient and on the ball—than it otherwise would have been.

In short, progress has been made, not only for the miners but for the industry, as his retirement announcement points out:

"The years have been long and individual burdens oppressive, yet progress has been great. At first, your wages were low, your hours long, your labor perilous, your health disregarded, your children without opportunity, your union weak, your fellow citizens and public representatives indifferent to your wrongs; today, because of your fortitude and deep loyalty to your union, your wages are the highest in the land, your working hours the lowest, your safety more assured, your health more guarded, your old age protected, your children equal in opportunity with their generation, and your union strong, with material resources.

"The progress made and objectives achieved in the coal industry have likewise been of immeasurable value

to the public welfare and the improvement in living standards of Americans as a whole.

"Tomorrow, as always, new problems will present themselves in endless succession. This fact need not cause apprehension in the mind of our members, so long as you keep your union strong, its policies sound, and give loyal support to the officers and representatives who serve you."

The record, however, includes nothing to lead to the conclusion that Lewis will abruptly vanish, never more to appear on the union-industry stage. As he suggests, the move will increase the possibility of an orderly transfer of power. If such comes to pass it will be no small asset, since a bitter battle for control of the union undoubtedly would set the industry back appreciably.

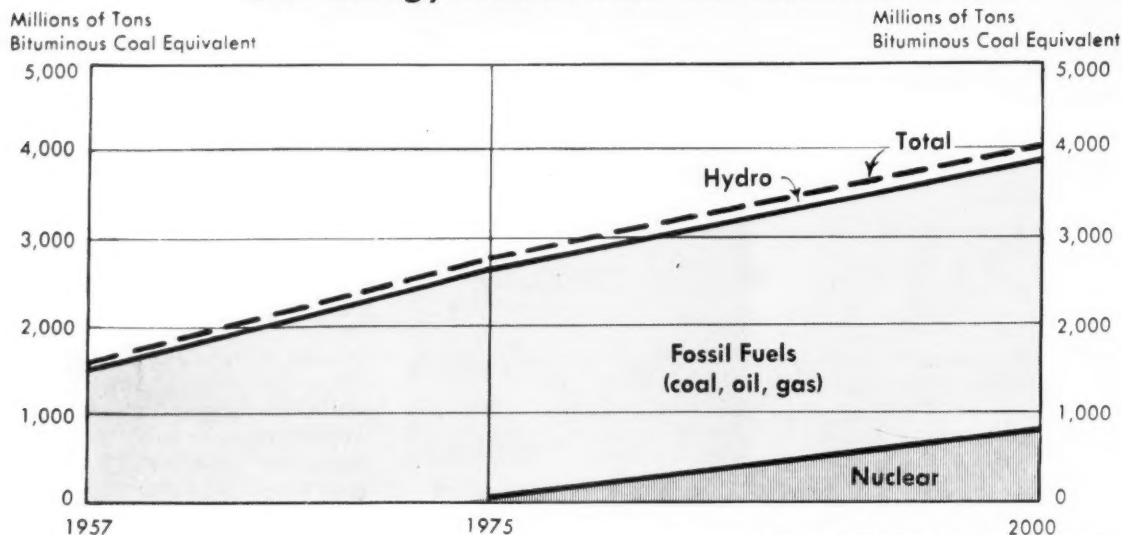
It can be assumed that regardless of the formalities Lewis will continue to wield the balance of power for some time to come and thus ease the stresses and strains of a change in leadership, in addition to giving the new regime direction and purpose. He will still be around though perhaps less under necessity to repeat to them his previously enunciated creed:

"I have never faltered or failed to present the cause or plead the case of the mine workers of this country. I have pleaded your case from the pulpit and from the public platform; in joint conference with the operators of this country; before the bar of state legislatures; in the councils of the President's cabinet; and in the public press of this nation—not in the quavering tones of a feeble mendicant asking alms, but in the thundering voice of the captain of a mighty host, demanding the rights to which free men are entitled."

Direction and purpose will continue to be vitally essential. The achievement of a more-perfect basis of cooperation in solving common problems, including competition, productivity, product quality, market development, improved public and government relations, and attainment of the utmost in safety, are still problems and are likely to remain problems for some time.

There is still a big job ahead—and the best in union talent, as well as management, will continue to be needed for as long as one can see into the future.

U.S. Energy Needs from All Sources



Data supplied by American Electric Power Co.

FOSSIL FUEL NEEDS for all energy uses are expected to grow from 1,540 million tons bituminous coal equivalent in 1957 to 2,620 and 3,053 million tons in 1975 and 2000, respectively. Will energy technology keep pace with this growth? Will shortages and bottlenecks occur? These are questions Congressional authorities must answer this year.

Fuels Policy: Battle in '60

Coal and competitive-fuel spokesmen are divided on motives, and energy-resources experts on the need, for a national fuels program.

COAL'S BATTLE for a national fuels policy will shift into high gear in 1960. Indirectly, the fact is evident from expert testimony presented the week of Oct. 12, 1959, in Congressional hearings on "Energy Resources and Technology." The fact is directly evident from the increasing tempo of head-on clashes between coal and competitive-fuel spokesmen on the merits of establishing a 16-man joint Congressional committee, as proposed last year by the 86th Congress.

At the hearings, statements strengthening the case for a national fuels policy included the following:

Joseph E. Moody, president, National Coal Policy Conference—"The maintenance of a strong, dynamic energy base in the United States is one of the most essential ingredients

in our national security. . . . Factors growing out of the lack of a national fuels policy are already tending to distort our domestic economy (for example, the New England residual oil situation, the restricted oil production schedule in Texas, and the depressed economy of West Virginia)."

George A. Lamb, manager, business surveys, Consolidation Coal Co.—"In wartime, coal consumption would jump immediately to 500 million tons a year and demand would rise to 600 million tons. Today, the wartime capacity of the industry is 500 million tons "and it is tending to shrink as its market appears insecure."

Dr. Sam H. Schurr, director, Energy and Mineral Resources Pro-

gram, Resources for the Future, Inc.—"We have estimated that, in 1975, electricity generation will account for 60% of the consumption of coal, compared to 37% in 1955. If anything were to seriously reduce the use of coal by electric power stations, as, for example, the successful development of economic atomic power might do, if not before 1975 then in later years, the effects on coal would be very serious, probably throwing the industry once again into its previous pattern of decline."

Philip Sporn, president, American Electric Power Co.—"I believe there is grave danger that so great an emphasis will be placed on atomic power development that we will tend to forget the essentiality of fostering the continued development of an adequate supply of coal, oil and gas."

At the hearings and elsewhere statements casting doubt on the need for or desirability of a national fuels policy include the following:

Dr. Bruce C. Netschert, senior research associate, Resources for the Future, Inc.—"All conventional energy resources should continue to be available, at least through 1975, at no appreciably higher cost. This is based on the finding that the natural stocks of these energy sources are higher than is generally estimated, and that the significance of technology as a dynamic element in cost determination has been under-rated."

Richard J. Gonzalez, treasurer, Humble Oil & Refining Co.—"National policies that encourage the development of domestic energy resources and allow competition among alternative fuels to the maximum extent consistent with national security have proved of great benefit to the Nation and to all consumers. Fortunately, the outlook for domestic energy resources does not call for a change in basic policies."

William J. Murray, member, Railroad Commission of Texas and chairman, Petroleum Research Committee—"As long as this Nation remains a democracy and adheres to its belief in the private enterprise system, then government, neither federal nor state, should attempt to fix price ceilings or floor on any competitively produced commodity, petroleum or other."

John A. Ferguson, executive director, Independent Natural Gas Association—"The major purpose of the National Coal Policy Conference is 'based on the theory of denying or prohibiting fuel which competes with coal from being used for certain purposes and denying the American consumer the right to choose between available fuels at competitive prices. We do not believe that such a program has any place within a free enterprise system.'"

Frank M. Porter, president, American Petroleum Institute—"The oil industry does not, and cannot, object to an open-minded, impartial study of the energy outlook and energy situation. . . . What we are objecting to is a study with prejudiced intent, a study that is not meant to serve the public interest or the well-being of consumers, but rather is intended to advance the self-seeking

aims of its advocates. . . . The study the coal industry wants, and expects, and is demanding would be a long step in the direction of 'end-use' controls."

With all the arguments developing for and against a national fuels policy, what then will be the outcome of the proposal? There is no pat answer to the question. **But, in opening the October Congressional hearings on the proposal, Chairman Patman perhaps called the tune on the ultimate criterion which will determine the outcome:** "Our concern is primarily with the possibility of shortages and bottlenecks in our resource base and of the risk that energy technology may not keep pace with growth." Following are abstracts of ensuing testimony, selected for the light they shed on these factors.

Coal and National Fuels Policy

Joseph E. Moody, president, National Coal Policy Conference, Inc.—"One of the questions that we are seeking to answer here is: What public policies are necessary to insure an adequate energy supply for our Nation while at the same time promoting the healthy and balanced development of the American economy? It is my firm conviction that the first and most important step needed to accomplish those objectives is the adoption of a single, overall national fuels policy. There are four principal reasons behind this strong belief:

1. Since the late thirties, every commission, committee, or study group that has dealt objectively with America's energy resources has urged that an integrated fuels or energy policy be adopted by the government . . .

2. The maintenance of a strong, dynamic energy base in the United States is one of the most essential ingredients of our national security . . .

3. The economic challenge of the cold war, so emphatically underlined by the visit of Premier Khrushchev, is yet another compelling reason for the adoption of such a policy . . .

4. Factors growing out of the lack of a national fuels policy are already tending to distort our domestic economy. As the Paley Commission pointed out, the nation's energy prob-

lem must be looked at in its entirety and not as a scattered collection of independent pieces; a problem in one sector must be handled with full consideration of its effects on related problems in other areas . . .

Joint resolutions were introduced during the last session of Congress, sponsored by 42 senators and 30 representatives, which would create a joint committee to make an impartial study of our fuels situation and subsequently formulate a national fuels policy. The coal industry is supporting these resolutions because we are convinced they will serve the best interests of the United States and thereby the best interests of the coal industry. We have hoped that the other fuel industries would lend their support for similar reasons.

Very much to my amazement, however, some spokesmen for the oil and gas industries have come out against this study. They have accused the coal industry of seeking unfair, selfish advantages by this means, they have charged that this step would eventually mean unwarranted government interference with and regimentation of private enterprise, and they have even suggested that since the Nation has survived for 150 yr without a fuels policy there is not reason to consider one now . . .

In my view, opposition by the oil and gas industries to a national fuels policy study would amount to taking the Fifth Amendment. I can readily understand how any one of the fuels industries, coal included, might oppose some specific proposals that might be included in a fuels policy. But I am simply unable to comprehend how any industry can oppose an impartial and objective study—unless, of course, that industry has something to hide. Consequently, I am confident that the responsible spokesmen for the oil and gas industries will strongly support the pending resolution . . .

George A. Lamb, manager, business surveys, Consolidation Coal Co.—"Bituminous coal's ability to survive under private enterprise as a strong and dynamic industry will be severely tested during the immediate years. It can, though perhaps under strain, operate effectively during the next 5 yr if it realizes the modest market growth that it should get as indicated by energy forecasts. Un-

Box-Score on Energy . . . Past vs Future

Table I—Energy Consumption, Gross National Product, and Population

	1955	1975 Estimates	Percentage change, 1955-1975
Energy consumption (in trillion Btu)	40,079	75,288	+ 88
Gross National Product (in billion 1955 dollars)	391	857*	+119
Population (in millions)	165.3	233*	+ 41
GNP per capita (in 1955 dollars)	2,365	3,678	+ 56
Energy consumption per capita (in million Btu)	242.5	323.1	+ 33
Energy consumption per unit of GNP (thousand Btu per 1955 dollar of GNP)	103	88	- 15

* The overall economic assumptions within which the analysis is conducted were determined by the basic objective of testing the adequacy of resources. Therefore, high overall economic growth rates have been assumed to test supply availability against requirements which are meant to be at the high end of a range of reasonable possibilities.

Table II—Energy Consumption, by Source

	1955	1975	% Change 1955-1975
Bituminous coal (million tons)	431	754	+ 74.9
Anthracite (million tons)	20	14	- 30.0
Oil and NGL (million bbl)	3,034	5,923	+ 95.2
Natural gas (billion cu ft)	9,614	19,881	+106.8
Hydropower (billion kwh)	120	265	+120.8
Consumed as electricity (billion kwh)	633	1,966	+210.6

Table III—Comparative Changes in Consumption of Various Fuels

	1920- 1940	1940- 1955	1920- 1955	1955- 1975
Bituminous coal	- 15%	- 2%	- 17%	+ 75%
Oil and NGL	+190	+129	+565	+ 95
Natural gas	+228	+238	+1,008	+107

Source: *Energy in the American Economy, 1850-1975* (forthcoming publication of Resources for the Future, Inc.). Preliminary figures. Tables I, II and III above are numbered 8, 9 and 10 in original text.

fortunately, this market growth is not in evidence because of the disruption in the fuel market caused by competitors . . .

Because of security considerations, the bituminous coal industry should have a capacity much larger than it has today. It should have a mining structure that would provide adequate tonnage in times of emergency. A wartime capacity of 600 million tons annually would be assured if the coal industry had a peacetime market of 500 million tons.

According to energy forecasts, bituminous coal will probably not have a 500-million ton market until after 1965. Today, its wartime capacity approximates 500 million tons and it is tending to shrink as its markets appear insecure. Once the gradual market growth, as indicated by the forecasts is established, improvement in mining capacity will follow . . .

Vital to Coal: A Bigger Share of Electric Market

Dr. Sam H. Schurr, director, Energy and Mineral Resources Program, Resources for the Future, Inc.—We estimate a total increase of energy consumption between 1955 and 1975 of 88%, compared with an increase in GNP of 119% and an increase in population of 41% [Table I]. Thus, energy is estimated to grow more

than twice as much as population, but to fall considerably short of the increase assumed for GNP . . .

The estimated consumption levels of the individual fuels and electricity are presented in Table II. Nuclear Energy, it will be noted, is excluded from these estimates. . . . We have preferred to make our analysis in terms of the conventional sources, and to let our results serve as a background for considering the possible impact of nuclear energy, as projected by others, on the energy position in 1975.

Among the fuels the largest increase, of more than 100, is found for natural gas, while the next highest is for oil (including NGL) which is estimated to grow by 95%. Bituminous coal is third, with an estimated increase of 75%. The greatest increase by far is not for a primary fuel, but for electricity which is estimated to increase by more than 200%, and within this total, hydropower is estimated to increase by about 120%. Only anthracite is estimated to decline, by about 30% from its 1955 level.

These findings continue the pattern of disparate growth among the fuels found in the historical record. However, there is a significant difference in that the growth rates for bituminous coal, oil and natural gas are not as far apart as has been the

case historically. By the standards of recent history the increases estimated for these three fuels are, in fact, very close. This can be seen by examining Table III, which compares the projected percentage increases between 1955 and 1975 for coal, oil and natural gas with those experienced in earlier periods. The wide differences among the three in their percentage changes for 1940-1955 or 1920-1955, when coal fell while oil and gas grew by large amounts, are in sharp contrast to the estimated percentage changes for 1955-1975.

What lies behind the change in pattern contained in the estimates? Without going into great detail, it is possible to indicate one set of circumstances that plays a very significant part. An important element is the high rate of growth estimated for electricity between 1955 and 1975. This produces a substantial effect on coal because in our estimates much of the growth in electricity generation is expected to be fueled by bituminous coal . . .

In the past, the growing use of coal by electric utilities could not offset the great tonnage losses coal experienced in railroads and in space heating. But the major inroads of gas and oil into coal's railroad and residential markets have already been achieved. The further losses

to be expected in the future will no longer be large enough to offset the estimated use of coal to fire electric power stations.

The estimated slowing down in the rate of increase for oil and natural gas involves similar factors: these fuels have realized their major gains at the expense of coal in rail-roading and household use, and consequently their growth in the future is expected to be less rapid than in the past.

The reversal in the trend for bituminous coal depends in the last analysis on its ability to capture a very large share of the growing electric utility market. We have estimated that in 1975 electricity generation will account for 60% of the consumption of coal, compared to 37% in 1955. If anything were seriously to reduce the use of coal by electric power stations as, for example, the successful development of economic atomic power might do, if not before 1975 then in later years, the effects on coal could be very serious, probably throwing the industry once again into its previous pattern of decline . . .

Technology: Primary Key To Plentiful Energy

Dr. Bruce C. Netschert, senior research associate, Resources for the Future, Inc.—All conventional energy sources should continue to be available, at least through 1975, at no appreciably higher constant dollar cost. This is based on the finding that the natural stocks of these energy sources are higher than is generally estimated, and that the significance of technology as a dynamic element in cost determination has been under-rated. Making allowance only for advances already under way, technology should be able to cope successfully with any deterioration of resource quality that may arise.

[Related to] the preceding presentation by Mr. Schurr, this general conclusion means that the projected demand levels for 1975 for each of the energy sources could be met entirely from domestic sources at no significant increase in constant dollar cost. . . . From the resource point of view, [self-sufficiency in energy] appears possible. What will happen

depends on political decisions and administrative decisions in both government and industry that are not considered here . . .

[Existing estimates on ultimate oil reserves] have engendered the widespread belief that the peak producing capacity of the domestic oil industry will be reached before 1975, or even within the next 5 yr, because of the comparatively small magnitude of the quantity of oil remaining to be discovered. This belief has been reinforced by statistics showing that the "drilling return" (the quantity of oil added to proved reserves for each foot of drilling by the industry) is declining sharply. . . .

[There is, however, no firm] basis for ascribing the currently increasing difficulty of discovery to a deteriorating resource position. It is all too easy to say that if we find less than we used to it is because there is less to be found. To do this is to assume that we are already probing for oil in all its possible occurrences, both areally and in depth. On the contrary, leading oil geologists have repeatedly called attention to the large potential oil-bearing areas (such as the Atlantic Coastal Plain) still unexplored, the possibilities of further intensive work in known oil-bearing areas, and the potential at depth in both known and unexplored areas. . . .

[Revised estimates made by Resources for the Future, Inc., show a potential supply of 500 billion bbl. compared to current estimates ranging from 80 to 190 billion bbl.]

What seems more likely is that we are pushing hard on the limits of our present discovery capabilities. With present techniques it is becoming more difficult to find new oil. But will discovery technology cease development henceforth? It does not require a dramatic breakthrough to justify the expectation of improved discovery ability in the future. Merely a continuation of the steady improvement in known techniques should be sufficient, for it is, after all, a compound growth.

For the medium-term future there is a more important reason for disagreeing with the pessimistic viewpoint. This is the more than 200 billion bbl known but currently unrecoverable oil. Newly developed techniques of increasing recovery, such as in-situ combustion and mis-

cible-phase displacement, give every indication of vastly improving overall recovery levels (pilot operations have approached 100% recovery), and the incentive to apply these new techniques to the hitherto unrecoverable oil that has no discovery costs would appear to be strong indeed.

Early evidence of the growth in these new techniques, together with the increasingly rapid expansion of older methods (such as water flooding), indicates the possible explosive growth of such secondary production. By 1975 the "secondary jackpot" could be contributing substantially to overall production. In addition, the application of the improved methods to new discoveries would also increase producing capacity.

It is therefore concluded that the domestic oil industry could meet the projected demand level in 1975 given by Mr. Schurr, and that this be done at no higher constant dollar costs due to resource depletion. The latter statement is based not only on the expectation of future technological progress but on the demonstrated ability of the industry to date to offset the increasing physical difficulties, such as, greater depth, without increasing costs. Statistical evidence of this ability is provided by the industry's drilling cost surveys and by the reports of individual company experience in the literature . . .

Published estimates of total future natural gas supply range from 500 to 1,200 trillion cu ft . . . [The crucial element in these estimates is] the "gas-oil ratio," which assumes that for each barrel of proved reserves of crude oil discovered the proved reserves of gas will be augmented by so many thousand cu ft. The gas estimates thus have a double basis, and because the two assumptions of crude oil supply and gas-oil ratio are compounded, there is considerable variation in the results . . .

Without going into detail, it appears that the consistently higher ratio in new fields and pools [will occur either because of] the depth factor, the rising value of natural gas, or both. There is strong evidence to indicate that the gas-oil ratio rises with depth, and, as wildcats lead the way to deeper producing horizons, it would be expected that the discovery ratio in new fields and pools would be higher and would rise faster. At the same time, the in-

creasing value of gas has stimulated the search for gas alone, the successful results of which would also tend to increase the ratio.

Regardless of the relative influence of the price and depth factors on the data, it is reasonable to assume that the gas-oil ratio will be higher in the future than in the past (although not necessarily higher than at present). The ratios used in the published estimates of future gas supply vary from 3,333 to 7,500 cu ft per bbl, with 6,000 as the most commonly used figure. In our work a ratio of 7,000 cu ft per bbl was chosen as a conservative expression of the belief that the ratio will be higher in the future . . .

It remains to apply the ratio of 7,000 cu ft per bbl to our own estimate of 500 billion bbl as the oil available for future recovery. Since the ratio is derived from data based on the proved reserve concept, however, the oil figure must be converted back to a proved-reserve basis. This means the figure of 500 billion bbl must be divided by three, which yields a figure of 167 billion bbl. Multiplying this figure by 7,000 gives 1,169 trillion cu ft of gas, or 1,200 trillion in round numbers. In this instance our conclusion is the same as that of the highest previous estimate [1,200 trillion cu ft] but with the feeling that it may well be conservative . . .

For the medium-term future, the general conclusions on producing capacity and costs are the same as those for crude oil. The projected demand level in 1975 for natural gas, given earlier by Mr. Schurr, could be met without any increase in constant dollar costs. The discovery prospects are better, and the same cost data apply . . .

[In its state-by-state compilation of reserves, the Geological Survey provides the only estimate of coal resources remaining in the U. S.—1.9 trillion tons.] Because of its relatively wide environmental limits [this estimate] is considerably closer to the resource base than are the oil and gas figures. With due allowance for the large error inherent in the estimate, . . . coal available for exploitation in this country is on the order of at least 2 trillion tons.

Such resources are clearly enormous, and in purely quantity terms there is no question about the ability

of the coal industry to meet any conceivable demand for many decades . . . Through improved mining and preparation techniques the coal industry should be able to cope with whatever decline in resources quality might appear before 1975 . . .

Whether progress in preparation technology will lead to the utilization of lower grade resources, or whether a decline in resource quality will generate advances in that technology is immaterial. What is significant here is that the cost benefits accruing from more efficient mining techniques should allow for increased preparation costs, stemming from the use of lower grade resources, without a net increase in total coal cost at the mine.

But this is not all; there are also possibilities of actually reducing the cost of delivered coal [through new and alternative methods of transport.] The clear trend over the past decades [has been] toward water and truck transport of coal at the expense of rail transport . . . The successful operation of the first commercial coal pipeline, at considerable savings over corresponding rail costs, has generated interest in additional projects of this kind, and the long distance conveyor belt for coal continues to remain a practical possibility. [Still another trend is mine-mouth use of coal by central-power stations and other industrial plants.] . . .

[Thus, aside from coal's unquestionable physical ability to satisfy 1975 demand,] this should be possible at no higher, and perhaps even at somewhat lower constant dollar cost . . .

[Existing estimates on developing hydro capacity do not allow sufficiently for] indicated technological advances in power site development and utilization . . .

The most important development is the pumped-storage technique, employing the recently perfected reversible pump-turbine. [The increasing size of utility units and systems] points to a rapid, widespread adoption of this technique. As larger and larger steam units are built, at higher cost per kw of capacity, the need for obtaining a high plant factor becomes more urgent as a means of keeping down the cost per kw-hr . . . Pumped storage offers an especially attractive means of coping with this problem . . .

Present indications point to a range

of 60 million to 70 million kw of installed [hydro] capacity by 1975. The implied growth rates in the lower figure are 4.1% per annum from 1958 to 1975, and 3.3% from 1961. The upper figure is meant to indicate the possibilities of pumped storage if this technique is exploited on a wide scale. The implied growth rates are 5.1% and 4.5% . . .

If the conclusions [on conventional energy sources] are correct, the burden of atomic energy growth falls entirely on that industry, at least in the medium-term future. If other energy costs do not rise, then atomic energy costs must close the present cost gap by coming down to conventional energy costs if this new power technique is to become an important element in the energy economy. Thus, atomic energy would appear to be limited to a minor role in the period through 1975.

Much the same can be said with respect to oil shale. Shale oil appears to be already marginal, at least as a gasoline source, and a shale oil industry should be in existence on a small scale before 1975 . . .

Oil and Gas:

Problems and Prospects

Richard J. Gonzalez, treasurer, Humble Oil & Refining Co.—Oil and gas have contributed immeasurably to the economic progress of the United States. They have become the principal sources of energy as a result of their usefulness and their attractive prices. Increasing supplies of these fuels will continue to contribute to economic progress and national security for the foreseeable future.

The domestic industry has demonstrated great ability (1) to expand both known reserves and production as warranted by the needs of our economy and (2) to keep real prices of oil and gas reasonable. Recurring fears of future oil shortages have consistently been dispelled by the development of new resources. Present reserves and productive capacity are greater than ever before and quite adequate in relation to current levels of demand.

The prospects are good that the domestic industry can continue to meet expanding needs in the years ahead provided reasonable incen-

tives exist for the large expenditures that will be required to conduct the necessary exploration and drilling. This favorable prospect might not materialize, however, unless the sound policies that have contributed to petroleum progress in the past continue in effect. Adverse changes in the tax provisions on production or restrictions limiting markets that may be supplied by gas and oil on a competitive basis could have a serious impact on the development of new resources, on the cost of energy to consumers, and on general economic progress.

National policies that encourage the development of domestic energy resources and allow competition among alternative fuels to the maximum extent consistent with national security have proved of great benefit to the Nation and to all consumers. Fortunately, the outlook for domestic energy resources does not call for a change in basic policies. On the contrary, careful analysis leads to the conclusion that our future progress will be served best by continuation of the same basic policies that have been so successful in the past in providing the United States with ample supplies of energy at reasonable costs.

William J. Murray Jr., member, Railroad Commission of Texas and chairman, Petroleum Research Committee—The Federal Government should continue its regulation of the interstate movement of oil and natural gas, but it should not interfere with the conservation regulation by the states of the production of petroleum regardless of whether such production ultimately enters interstate commerce.

It is this witness' conviction that so long as this Nation remains a democracy and adheres to its belief in the private enterprise system, then government, neither federal nor state, should attempt to fix price ceilings or floors on any competitively produced commodity, petroleum or other.

If this philosophy is unacceptable to Congress, then I suggest that if price regulation is to be attempted, however contrary to American principles it may be, that an understandable, administrable, practical method of price fixing should be adopted to replace the present completely confusing, ultimately chaotic system of

utility-type regulation which has been thrust upon the Federal Power Commission for gas, and would of necessity, if any consistency is to be followed, ultimately have to be adopted for oil and coal . . .

Arthur Kline, commissioner, Federal Power Commission—The natural gas industry should enjoy a steady period of growth in the years ahead . . . However, there are several factors which may limit this growth . . .

In this country, most of our proven reserves, estimated to total 254 trillion cu ft at the close of 1958, are dedicated to meet the requirements of existing pipelines. [Although imports of liquefied methane from Venezuela, when competitive, and imports of natural gas from Canada will contribute to supply,] any substantial future expansion of the industry must be based upon reserves which have not yet been discovered.

While most authorities seem to feel that there is little question that we should be able to find these reserves, and estimate the ultimate recoverable reserves of this country at figures varying from 1,100 to 1,700 trillion cu ft, there are other eminent authorities who seriously question these estimates, and the manner in which they are made, and express doubt that this country will discover as much gas in the next 15 yr as in the past 15 yr . . .

The factor most likely to retard future growth of the natural gas market will be the inability of gas to compete in price with coal and fuel oil, its chief competitors. Until recently, gas has enjoyed a distinct price advantage, but in the last few years this advantage has diminished and even disappeared in certain areas insofar as the industrial markets are concerned.

Fuel oil and coal are still unable in most areas to compete with gas for domestic and commercial uses, but since the industrial load comprises more than one-half of the total gas consumption, any substantial loss in this area will seriously affect the growth of the natural gas industry . . .

For Future Electric Loads: Don't Neglect Fossil Fuels

Philip Sporn, president, American Electric Power Co.—I project the country's electric requirements in

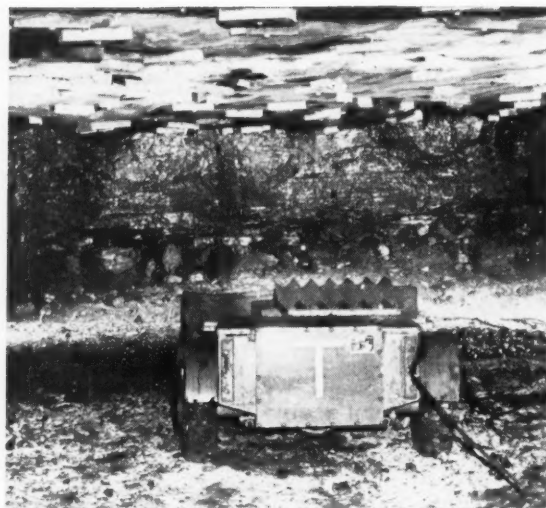
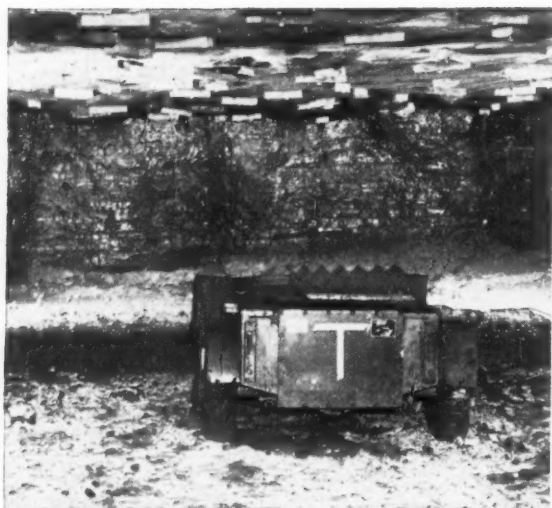
1975 at 2,000-billion kwhr. Assuming an average efficiency of 9,000 Btu per kwhr, this represents a fuel requirement equivalent to 700 million tons of coal, compared with less than 300 million tons in 1957. Of this total 1975 generation, I have estimated that only 150 billion kwhr, or 7.5%, will be generated by nuclear power . . .

For the year 2000 I have projected total generation of 6,000 billion kwhr, or nearly ten times the 1957 figure. Nearly 40% of this total will still be generated by coal, a small amount by fuel oil and gas, a somewhat larger but still relatively small amount by hydroelectricity, and the largest percentage by nuclear energy . . .

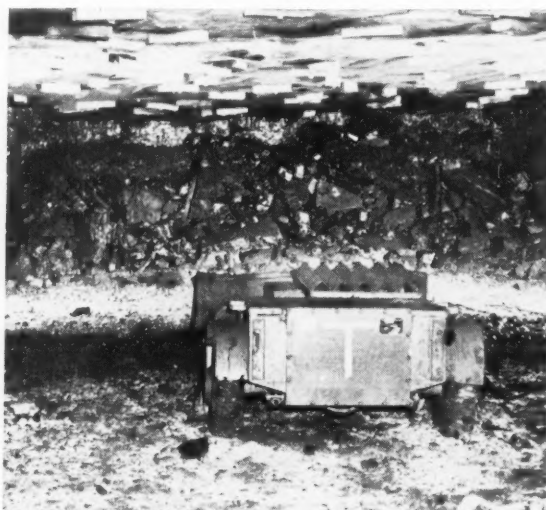
Despite this optimistic projection of electric energy use and the assumption that nuclear power will account for over 75% of the increase in electric energy generation between 1975 and 2000, the part of our total energy requirements to be satisfied by nuclear energy, according to my estimates, is only slightly over 20%, that is, 850 million tons of coal-equivalent out of a total requirement of 4 billion tons. This would still leave almost 80% of our total energy requirements to be supplied by conventional sources, and of this 80%, approximately 20% will go to generate electric power; the remaining 60% will be available for all other energy work.

It is clear, then, that our total energy requirements in the year 2000 and in the intervening period will necessarily require very large amounts of fossil fuel. I believe there is grave danger that so great an emphasis will be placed on atomic power development that we will tend to forget the essentiality of fostering development of an adequate supply of fossil fuels.

If these projections have any validity—and they would have, even if we allow fairly wide latitude for error—they indicate that we must not forget the continuing importance of our fossil fuels . . . We must make certain in our policy considerations that they will be capable of fulfilling their important role of providing the far larger-share of our total energy needs that nuclear power, even under the most favorable conditions, will not be able to satisfy, at least for the remainder of this century . . .



A **SUBSTANTIAL BOOST** in coal-breaking efficiency results from the use of multiple shooting with compressed air. Four shells in a row of blastholes "fire" in sequence. New shells have no shear strips and are lighter in weight.



SHOTFIRER services a full row of holes on each trip to face, taking shells from broken coal and placing them in next higher row. There are no adjustments to be made since discharge heads in new shells operate automatically

Healthy gains in productivity at Green Diamond result from . . .

Multiple Shooting . . . With Air

Progressive management and productive workers apply new, high-capacity conventional equipment to keep their Illinois deep mine competitive.

SUBSTANTIAL savings in time, reflected in increased production per unit shift, results from the use of a face-preparation cycle that includes multiple-hole coal-breaking with Air-

dox at Green Diamond mine, Mid-Continent Coal Corp., Marissa, Ill. Unit crews of 15 men average over 900 tons per shift, clean coal, or 1,100 tons of raw coal, from the 7-ft

Illinois No. 6 seam. Two units operate two shifts a day for a total production of 3,600 tons of clean coal daily.

Heart of the new coal-breaking

SEQUENCE VALVES on truck admit air to shells one after another. Connection to main airline is made at rear of truck, as shown above.



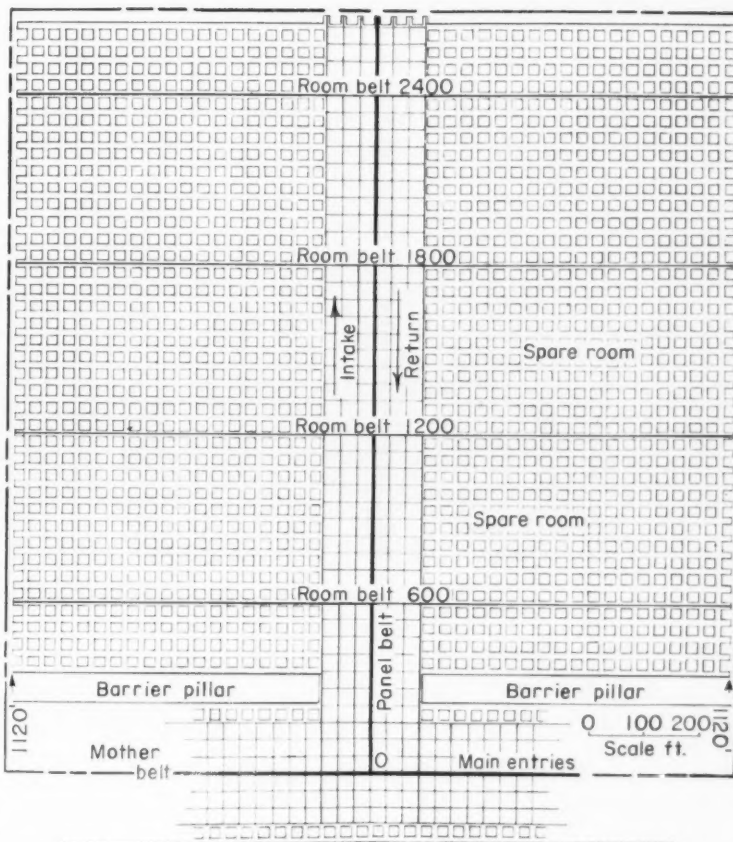
technique is a sequence valve, designed by Airdox-Cardox Products Co., which feeds air at 10,000 psi to one after another of a series of Airdox shells in a row of drillholes. Repeated trips to the face by the shotfirer are eliminated; therefore, less time is required to break a cut of coal. Furthermore, a new discharge head has been developed for the shells which does away with shear strips and the necessity of changing them. Added to these benefits is the fact that the new shells weigh only 37 lb each, as against 52 lb for conventional shells. The coal-breaking operation at Green Diamond, which was once the bottleneck in face preparation, is now crowding the other operations hard.

The sequence valve is installed on a special self-propelled car which also carries the shells. The car is the familiar "Inspector's Friend," furnished by Long Co. The permanent Airdox line is connected to the battery-powered car through flexible high-pressure tubing.

Arthur S. Macke, vice president and general manager at Mid-Continent, a subsidiary of Snow Hill Coal Corp., Terre Haute, Ind., points out that marketing conditions facing the company make it necessary to produce conventionally mined coal at a competitive cost in an area where big-scale stripping and continuous mining are the rule. The constant accent is on increasing efficiency, Mr. Macke says, but not at the expense of safety.

Green Diamond's safety record speaks for itself. Over 6¼ million tons have been mined without a fatality since the mine opened in 1949, and the working force was the first in the nation to complete 100% retraining in accident prevention (USBM). However, the purpose of this article is to describe some of the ways and means employed at Green Diamond to achieve a productivity level of 26 tons per payroll employee per shift while continuing the quest for still higher efficiency.

The procedure follows the classic



AT GREEN DIAMOND all openings are on 60-ft centers. Entries are 18 ft wide, crosscuts are 20 ft wide and rooms 24 ft wide.

pattern of eliminating a bottleneck in any phase of the cycle, then being alert to identify and alleviate the pressures that arise in other phases as a result of the elimination of the original bottleneck. In the recent instance of converting to "Mobile Mul-

tipple Shooting" with Airdox the pattern unfolded as follows:

Coal-breaking using the single-shell system required the services of three men per shift to keep up with other operations. Furthermore, much of the shooting had to be done between

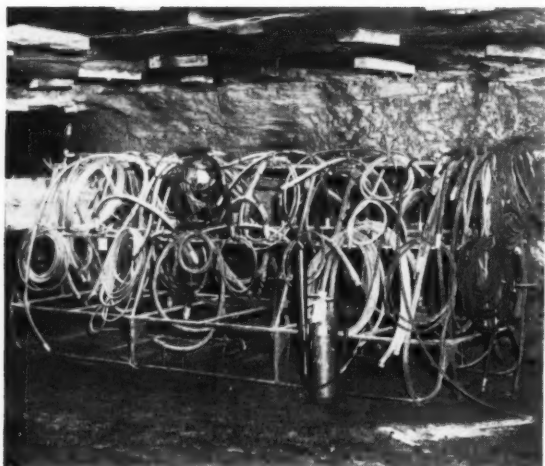


A REEL for belt or cable.

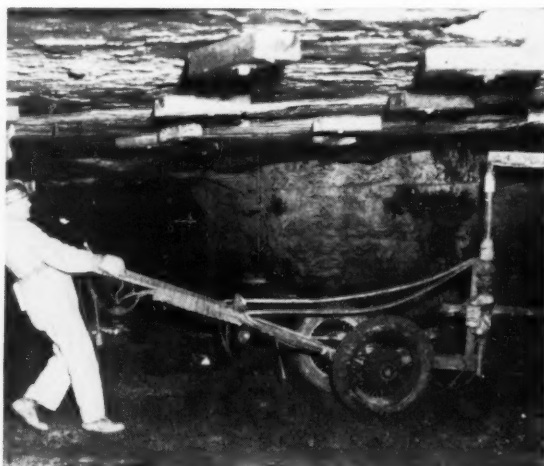


A SUPPLY SLED near the active workings.

Special-purpose units promote top section efficiency at Green Diamond



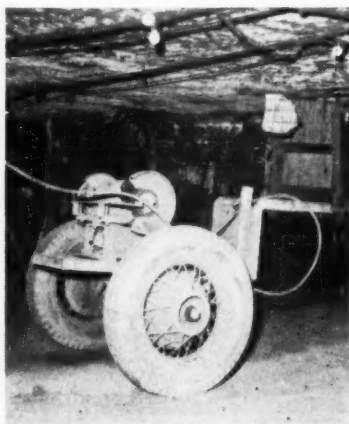
A SKID RACK for replacement hoses to keep them near point of use.



A WRENCH for reclaiming roof bolts (two men, 600 bolts average per shift).



BATTERY-POWERED personnel and supply carrier for trackless operation.



PORTABLE WHEEL to aid in reconditioning roof bolts prior to additional use.



TRAILER for transporting men to and from working places to save time.

shifts to prepare coal for the oncoming crew. Using the multiple system, two men can break the coal for a unit crew. This increase in coal-breaking capability then placed a strain on the drilling capacity, but Mr. Macke points out that the present CD-26 coal drills are being replaced by new CD-43 drills to restore the balance.

The speed up in drilling and coal-breaking operations throws the burden on the roof-bolting phase of the cycle. This can be relieved by careful evaluation and selection among new high-capacity bolting machines now on the market. And so it goes, until the process comes full circle and puts the pressure on the loading operation again. This chain of events has occurred before at Green Diamond, and the solution was to provide spare loaders, thus permitting better on-shift maintenance of all loaders and the use of different loaders on the two sides of a section to eliminate time-consuming moves.

Management's Goal

The goal of Mid Continent's management in seeking better shooting performance was to achieve a production rate of 4,000 tons of clean coal per day, using 14-man crews. This meant that at least 30 places (480 holes) per unit shift would have to be shot and drilling performance would have to speed up accordingly. Average performance at the time the campaign was begun was 360 holes per unit shift.

Mobile multiple shooting works like this:

The shooter drives the battery-powered car, carrying shells, air lines and sequence valve, to the face. The car is positioned about 25 ft back from the center of the face after the shells have been unloaded at the face, and the connection to the permanent air line is made.

The shells, already connected through flexible tubing to the sequence valve manifold, are inserted in the bottom row of holes. The men retreat to a safe place, and the shooter introduces air into the sequence valve by a single operation of the blow-down valve, as in single-hole shooting. Provision is also made to bleed high-pressure air from shells and car at the blow-down valve in the event that shooting pressure fails to build up properly.

The shells "fire" in sequence, one after another, at intervals of from 12 to 15 sec. The shooter then returns to the face, picks up the lightweight shells and inserts them into the next

higher row of holes. The blow-down operation is repeated until all rows of drillholes have been broken. The holes are 3-in in diameter to take the 2½-in shells.

The car is trammed to the face to retrieve the shells and then is driven to the next place.

The process, of course, is easier to write about than to perform. In the initial stages of the work there were problems to be overcome. Certain modifications were required in the sequence valve and automatic discharge head in the shell, and the shooters had to become familiar with the system.

However, the management team at Mid Continent could see the beneficial possibilities in the system and decided to stay with it and make it work. Mr. Macke is particularly proud of the way a unit foreman, Matt Pickford Jr., devoted time, energy and enthusiasm to the promotion and refinement of the new idea. He wants it also known that Bill Noell, the Airdox-Cardox representative from Benton, Ill., was most helpful and available during this period.

The recovery plan at Green Diamond is shown in the accompanying diagram of a room panel. The boundaries of a room panel encompass an area of 160 acres, or ¼ sq mi, measured from the mother belt in the mains to the back of the panel. The panel belt is installed in the center one of seven headings which comprise the panel entry. Rooms are driven at right angles in sets of nine, from the outer panel headings. Each mechanical unit drives a set of nine rooms with the room belt in the center room.

A spare room, introduced into the system to provide maximum flexibility, is driven between the two sections, as shown. The coal from this room is available to either mining crew, whichever needs it more or can get it easier. For example, if natural conditions in one section interfere with smooth operations section equipment can be moved into the spare room to continue producing coal while the situation is cleared up. When both sections are operating smoothly the crews take turns in removing cuts from the spare room.

The rooms are driven to the right of the panel entry advancing and to the left retreating. This insures that intake air is first passed over the active faces, then coursed through the completed workings. Pillars are left in place, and panels are sealed after the rooms on the left side have been worked out by production crews.

AC Cables . . .

Correcting the Record

In extensive revision of the original manuscript to update it and incorporate changes after it was first written and submitted for publication a few items were overlooked in the two-part article on "AC Cables," by F. R. Hugus, Joy Mfg. Co., in the November and December, 1959, issues of *Coal Age*. Those items should be corrected as follows:

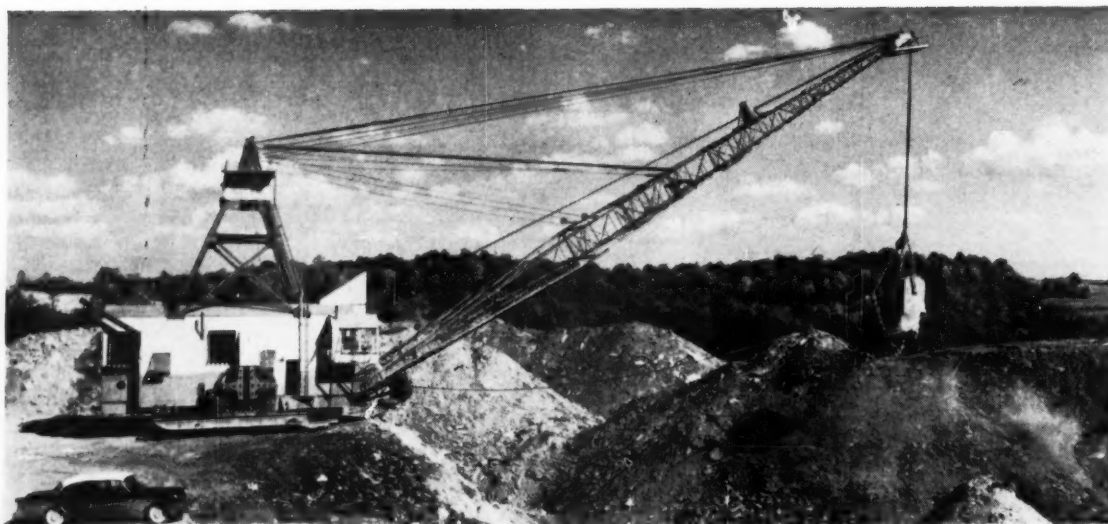
Bending radius for 3-conductor mine-power-type and borehole or shaft-type cables (Table V, pp 110-111, November, 1959, issue) should be twice the size originally shown:

Conductor Size, AWG	Minimum Bending Radius, In.
4	20½
2	22½
1	23½
1/0	24½
2/0	26½
3/0	27½
4/0	29
MCM	
250	31¼
300	32¼
350	34
400	35½
500	37½

Cable diameters in Table X (p 132) in the second part of the feature (December, 1959, pp 128-134) should be:

Conductor Size, AWG	Approx. Cable Outer Diameter, In
6	1.43
4	1.54
2	1.68
1	1.79
1/0	1.88
2/0	1.99
3/0	2.10
4/0	2.23
MCM	
250	2.45
300	2.58
350	2.69
400	2.79
500	2.97

These data, and other data in Table X, apply to cables rated from 3,000 to 5,000 V, instead of 5,000 V alone as originally shown.



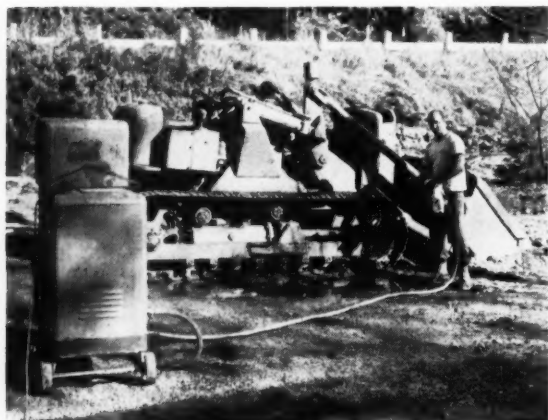
NEW 12-YD DRAGLINE enables company to dig deeper and improve stripping efficiency to offset rising costs in other phases of operation at Industrial Mining & Engineering Co., Lisbon, Ohio.



DRAG AND SHOVEL often work as a team in removing overburden from the No. 6 seam. Cuts usually are 100 ft wide.



SUPERVISORS' VEHICLES are equipped with two-way radios, tools, welding unit and other essential equipment.



EQUIPMENT to be overhauled in central shop is steam cleaned before maintenance work starts to speed repair cycle.



SMALL SHOVEL is being checked after completion of major overhaul. Boom, handle and shovel will be mounted outside.



AERIAL VIEW of Pit No. 2 shows large dragline removing overburden from the No. 6 seam. Practice is to work the cuts along the contours when conditions permit.



PORTABLE DRILL works on bench-type terrain. Overburden is sandstone.

How Industrial Mining & Engineering Co. gets results in . . .

Stripping 36-in Coal in Ohio

UP-TO-DATE EQUIPMENT for stripping and hauling and well-planned methods, that to some extent combine backfilling with stripping, lead to higher efficiency at the operations of Industrial Mining & Engineering Co., Lisbon, Ohio. The main unit employed by the company in recovering the No. 6 seam is a 9W Monaghan dragline equipped with a 12-yd bucket and 165-ft boom. This new unit has enabled the company to

dig deeper and improve stripping efficiency. Also it made available for stripping, in many instances, territory that could not be reached before. Too, since the seam was under thicker cover a better quality coal could be produced.

The Industrial Mining & Engineering Co.'s property is in Columbiana County, Ohio, with main office at Lisbon. Property consists of 4,300 acres, leased and owned.

The No. 6 seam is 36 in thick and lies reasonably close to the surface. Average overburden ranges from 45 to 50 ft but occasionally thickens to 80 ft.

Other stripping equipment used by the company in working the No. 6 seam consists of a 2400 Lima with a 6½-yd bucket and 110-ft boom and a 4500 Manitowoc equipped with a 5-yd bucket and 120-ft boom. Small shovels include an 820 Lorain, 34



A STOCKPILE of 10,000 to 20,000 tons of sized coal is maintained by the company to handle large orders on short notice.



18-TON TRACTOR-TRAILERS are being refueled to deliver coal to consumers. Maximum haul to consumers is 100 mi.

BLASTING CHART

Hole Depth Ft	Cubic Yards per Hole for Different Patterns						
	15' x 15'	18' x 18'	20' x 20'	22' x 22'	25' x 25'	28' x 28'	30' x 30'
15	125	180	222	269			
18	150	216	267	323			
20	167	240	296	359			
22	183	264	326	394			
25	208	300	370	448			
28	233	336	415	502			
30	250	360	444	538			
33	275	396	489	592			
35	292	420	519	627			
38	317	456	563	681			
40	333	486	593	717			
43	358	516	637	771			
45	375	540	666	807			
48	400	576	711	860			
50	417	600	740	896			
53	442	636	785	950			
55	458	660	815	986			
58	483	696	859	1040			
60	500	720	888	1076			
63	525	756	933	1129			
65	542	780	963	1165			
68	567	816	1007	1219			
70	583	840	1037	1255			
73	608	876	1081	1309			

Nitrate Loading in Pounds for Various Hole Burdens

Expected Yield Yd Per Lb.	Hole Burden, Cubic Yards														
	125	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
Total Nitrate Charge per Hole, Lb.															
1	125	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
1½	83	133	200	267	334	400	467	534	600	667	734	800	867	934	1,000
2	62	100	150	200	250	300	350	400	450	500	550	600	650	700	750
2½	50	80	120	160	200	240	280	320	360	400	440	480	520	560	600

BLASTING CHART is used by driller and blaster to determine the amount of ammonium nitrate required for different drilling patterns, hole depth and type of overburden. The chart eliminates guess work.

Lima and 65 Bay City. These latter units are used for loading coal and on occasion serve for stripping thinner cover where these smaller units can be operated at maximum efficiency.

Essential auxiliary equipment consists of a Davey heavy-duty rotary air drill mounted on a crawler tractor which can drill blastholes up to 9 in in diameter; two McCarthy horizontal drills for drilling holes up to 6 in; Euclid TC 12 and Allis-Chalmers HD 21 tractors (total of seven); and end-

dump off-highway Euclids and 18-ton on-highway Mack trucks.

Preparing the Overburden

Overburden on the No. 6 seam consists of a very abrasive sandstone and shale. The sandstone usually lies 3 to 30 ft below the surface and varies in thickness from 10 to 40 ft. Underlying the sandstone is a thin strata of shale which is directly over the coal.

Since the sandstone varies in depth from the surface a bulldozer is employed to handle scalping operations in conjunction with the stripping units. This operation, however, is performed before blastholes are drilled. Upon completion of the scalping operation the area to be drilled generally consists of several benches (see photo) with difference in elevation between top and bottom benches being as much as 30 ft.

Blastholes are 8 in but the size can be varied depending on the type of overburden. Holes are drilled on 25-ft centers and usually include an area 100x125 ft (one row contains four holes, the other five) in from the last pass.

Industrial Mining makes its own blasting agent but quite often they purchase premixed ammonium nitrate and fuel oil to compare their blasting agent with other mixtures.

Holes are charged at a ratio determined by a chart prepared by the company (see illustration). This chart takes into account center distances and depth of holes to obtain the yield in cubic yards for various depths and patterns. Normally a minimum of 1 yd per pound to a maximum of 2½ yd per pound is used. To determine, for example, the amount of ammonium nitrate required per hole when using an 18x18-ft pattern with holes 18-ft deep and in a type of overburden that by experience has proven a need for 1 lb per 1½ yd to effect good fragmentation, can be found quickly by referring to the chart. In this particular case 144 lb of ammonium nitrate per hole will be required.

Since the blasting chart has been used to determine the right amount of explosive per hole, consumption of ammonium nitrate has decreased with fragmentation as good or better than before. When conditions change from one setup to the next the chart enables the driller and blaster to apply the correct amount of explosive, thus eliminating guess work.

In constructing the chart yards-per-pound was determined by experience in drilling the types of overburden on the property, plus the drilling rate in each type.

Dry cuttings from the vertical holes are used for stemming. Primacord and electronically controlled caps are used along with dynamite in setting off the blasts. Normally, all holes (20) are set off at one time when the



RECLAMATION is given priority at Industrial Mining. Last year company used 3,000 lb of grass seed and 20,000 trees.



MAINTENANCE ACTIVITIES are supervised by Warren (Dusty) Rhodes, master mechanic of over-all operation.

operation is in isolated areas; otherwise the company uses delay caps.

At times it is necessary to do secondary blasting. This is accomplished by drilling horizontal holes. Cuttings from horizontal holes are placed in special bags and placed in holes for stemming. Ammonium nitrate is used in horizontal holes also.

Removing the Overburden

The company relies on the 12-, 6½- and 5-yd draglines to remove overburden in the pits, with one exception; that is, a large bulldozer which works ahead of the 12-yd drag preparing the terrain. This preparation includes scalping as much as 30 ft of overburden (down to the sandstone) and leveling the terrain for the dragline and vertical drill.

Cuts usually are 100 ft wide. Normal practice is to work the cuts along the contours when conditions permit. In this operation the spoil from each new cut fills the previous cut after coal has been removed up to the final highwall. Under certain circumstances, however, the company resorts to special methods. Backfilling to cover the exposed coal under the final highwall is eliminated, and the only reclamation required is to shape the spoil peaks.

Advanced exploration is included in the company's stripping program to eliminate costly errors and to better plan stripping procedure for the future. The Pontiac Drilling Co., Salem, Ohio, performs much of this work but occasionally the vertical drill is substituted for a core drill. Locating



OWNERS OF THE COMPANY are James Pappas (not shown), James Chengelis (left), Gus and Chris. Steve Chengelis (right) is superintendent for the company. The four brothers manage the operation as a team.

coal, mapping property and surveying land are included in the exploration program.

Another outstanding feature in the company's operation is land reclamation. Approximately 120 acres are reclaimed each year. Last year, for example, a total of 3,000 lb of grass seed and 20,000 trees were planted.

Loading and Hauling

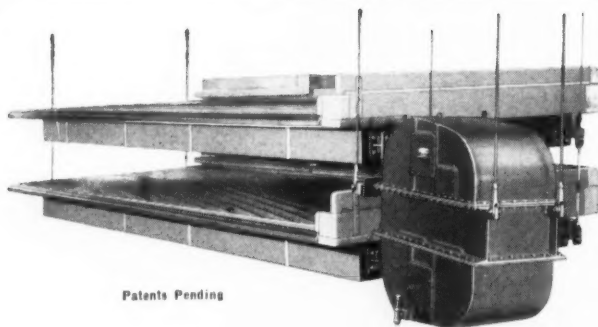
Before coal is ready for loading the top coal is cleaned with a small bulldozer, grader and power sweeper. The 820 Lorain, 34 Lima and 65 Bay City shovels are used to load coal into trucks. Coal is loaded from the solid. Eighteen-ton Mack tractors and trailers are used to haul coal to the tippie

for sizing. When coal must be crushed before going to consumers it is loaded into off-highway Euclids which haul to a crusher in the pits.

The company's entire tonnage is shipped via trucks. Pickup is by commercial haulers or customers' trucks. The Herron Transfer Co., Salem, Ohio, does most of the hauling for Industrial Mining. As many as 40 Macks may be contracted by the company to haul to its customers. The maximum distance to consumer is approximately 100 mi.

Facilities for hauling r-o-m and for crushing coal at the pits, and also for sizing at the tippie, enable the company to supply customers with the size of coal they desire at minimum cost.

(Continued on p 86)



Patents Pending

The CONCENCO® "77" Table Permits You to Build Smaller Coal Washing Plants

The revolutionary "77" table with its twin decks is not only able to double the feed capacity in a unit of floor space, but it halves the laundering, piping, wiring and connected power requirements.

You are thus able to build more compact and less costly structures for your fine coal cleaning operations. And because the "77" table is in floating suspension, with impact to the building virtually eliminated, lighter construction is permissible to effect further economy.

Cleaning efficiency is in the same high range for which the single deck SuperDuty® table has long been famous.

For complete information, send for Bulletin 77.



CONCENCO® Feed Distributor

While unexcelled for feeding coal washing tables, the CONCENCO Feed Distributor effectively provides an accurate splitting of feed into any desired number and proportion of parts to feed circuits or machines in battery for their greater overall efficiency. It is a heavily fabricated all steel machine with motor drive requiring 1 h.p. or less in operation.

THE DEISTER ★ CONCENTRATOR COMPANY

723 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

CONCENCO
PRODUCTS

★ The ORIGINAL Deister Company • Inc. 1906

R-o-m or crushed coal is supplied to customers directly from the pit. Coal processed at the tippie is for customers requiring specific sizes. Industrial Mining also maintains a 10,000- to 20,000-ton stockpile of various sizes of coal. This enables them to fill large orders without delay while continuing to supply regular orders.

Company Background

The company is owned by James Pappas and three brothers: Gus Chengelis, president and general manager; James, business manager; Chris, sales and administration. Steve Chengelis is superintendent of operations and Sam Cosma is superintendent of Pit No. 2. Each brother has a phase of the operation to manage but generally they work as a team helping one another as the need arises.

Industrial Mining & Engineering Co., was founded in 1946 by Gus and James Chengelis and James Pappas. The initial operation was in Pennsylvania but was moved to Lisbon, Ohio, in 1948, when Chris joined the company after being discharged from the Navy. When this move took place the company sold its holdings in Pennsylvania and concentrated operations in Ohio.

The stripping operation is on a 24-hr schedule, 7 days a week. The company employs 65 to 70 persons from the immediate area. Several of the employees have been with the company for 10 yr or more. Among this group are: Steve Chengelis, superintendent; Walter (Zip) McDevitt and Harold (Big Mike) Delisio, operators of 9W drag; Leroy (Pee Wee) Tullis, operator of 2400 drag; Neal Crowl, operator of coal loader; and Robert Hamilton, office manager.

Coming Next Month:

The February issue of *Coal Age* brings a review of events in 1959 in coal and a look ahead into 1960's prospects. Leading off the review session is the economic roundup of what happened last year and what those events augur for this year. Also included will be a review of deep mining, stripping and preparation highlights of 1959, a recap of safety in 1959 and an analysis of sales of equipment, all regular starters in *Coal Age's* annual review issues . . . plus feature articles and departments, as always.

SAVINGS up to 20% on CONVEYOR COSTS 12 to 60% GREATER HAULING CAPACITY ...possible with RAY-MAN CONVEYOR BELT



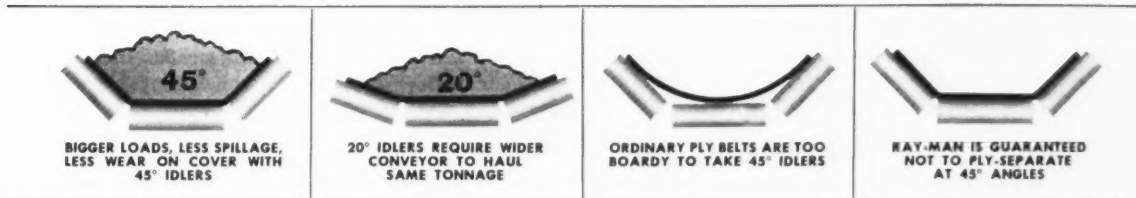
It's a mathematical certainty that a belt can haul bigger loads with 45° idlers than with regular 20° idlers. But the 45° angle between concentrating idlers and bottom roll idlers is too sharp for an ordinary heavy duty conveyor belt. Plies separate, but modern RAY-MAN CONVEYOR BELT licks this problem ... for all time!

Ray-Man's exclusive flexible construction and built-in stress compensation are guaranteed to take the sharp

angle of 45° idlers without ply or cover separation at the hinge line. This opens a whole new era of conveyor design ... permitting larger loads ... narrower conveyors ... assuring longer cover wear ... lower handling costs!

Ask your R/M representative to show you how Ray-Man Conveyor Belt with 45° idlers can give you the most for your conveyor dollar ... write for new Bulletin M303, "Ray-Man for 45° Idlers."

RAY-MAN BELT IS BUILT TO TAKE THE EXTRA STRESS OF 45° IDLERS

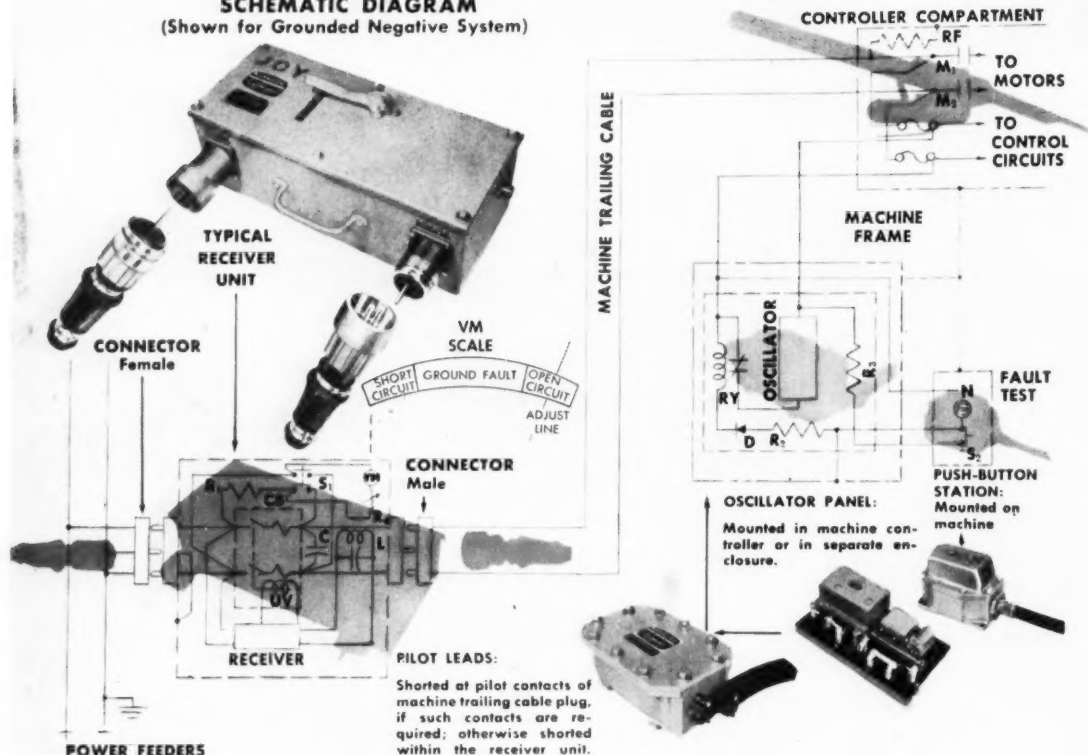


RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY



RM-1024
ENGINEERED
RUBBER
PRODUCTS
... "MORE USE
PER DOLLAR"

SCHEMATIC DIAGRAM
(Shown for Grounded Negative System)



New Mining-Machine Protection

Personnel and machine protection without a separate ground wire—how one unit was developed, how it operates and what it accomplishes.

G. P. Benish, Manager, Mining Sales, Electrical Products Div., Joy Mfg. Co.

SINCE THE INTRODUCTION of electrical equipment with trailing cables in U.S. coal mines, the attendant shock and ignition hazards have presented a difficult and complex problem. Reflecting this, the Federal Mine Safety Code of July, 1946, decreed that such equipment, "shall be grounded effectively." As a result, frame grounding became a highly controversial subject.

A frame-ground wire was one practical solution for this problem. However, many mine operators

pointed out new problems and hazards created by the introduction of the frame ground wire and argued that these more than offset the advantages. It was in recognition of the logic of both ideas that the clause was changed in the revised Federal Mine Safety Code of October, 1953, to read, "shall be grounded effectively or equivalent protection shall be provided."

The question of what constitutes "equivalent protection" was finally clarified when Bureau of Mines Schedule 2F became effective in August, 1955, providing that: "All machines which receive power from an external source and which cannot be considered as being in intimate

electrical contact with earth shall be provided with means for maintaining their frames at ground potential, or with a device, enclosed in an explosion-proof compartment, that will disconnect power from the equipment in the event of a ground fault."

Several "equivalent protection" devices were introduced for mounting on the machine to open the main contactors should a ground fault occur. These are effective only on faults occurring in the main contactors as the machine frame can remain alive if the fault is anywhere out by that point. While such devices do not protect against faults occurring at some of the most vulnerable points, such as, cable entrance, cable reel, etc., and provide no protection for the trailing cable, they were the forerunners of, and served to further define a need for, true "equivalent protection."

Development of an "equivalent-protection" device by Joy was initi-

* Abstract of a paper presented at the Coal Mining Sec., 1959 National Safety Congress.

ated in April, 1956, based on a theory of operation conceived several years earlier. Technical advances in the general field of electronics, particularly in transistor development, eliminated some of the seemingly insurmountable problems. It was thus possible, in July, 1956, to carry out, on a shuttle car, tests of an improvised model to prove the theory of operation although many problems remained to be solved.

By the summer of 1957 a final design was being approached and a prototype unit was placed on a continuous miner for a period of about 2 mo. The test was considered to be successful but not conclusive when the unit was removed from service. In December, 1957, at the Joy experimental mine, the device was demonstrated on a shuttle car for representatives of the Bureau of Mines who had been aware of the development since its inception.

The test, considered 100% successful, paved the way for setting up the final packaging and completion of drawings before submitting the device to the bureau for acceptance. However, it was felt that further field testing on production units would be desirable before freezing the design. During the summer of 1958 a field test on two shuttle cars in a gassy mine was conducted with permission of the bureau and the West Virginia Dept. of Mines. These two units were on the machines approximately 4 mo during which time the machines worked 130 shifts.

Since it was not possible to have an engineer on hand at the mine at all times, operating personnel were instructed not to attempt any repairs but to simply circumvent the devices in the event of an outage. The machines were equipped with frame ground wires in the trailing cables which were not connected for the tests but were arranged so that they could be cut into circuit when the new protective device was circumvented and machines operated with their usual circuit breaker protection. During the test period there were numerous occasions for the new device to perform and it did so without exception. No component part failed.

Early in 1959, the device christened the "Electronic Sentry," was accepted by the USBM as a method of providing frame-ground protection. A file number was assigned to the

enclosure for mounting on the machine, certifying that it is explosion-proof and suitable for use on permissible equipment without further test or inspection.

True Equivalent Protection

In the final design the original goal of complete effective "equivalent protection" without a frame-ground wire was achieved and, in addition, numerous other desirable features were attained. The new device . . .

1. Permits the use of two-conductor cable in a completely safe and approved manner.
2. Provides positive protection for ground faults occurring anywhere on the machine.
3. Provides positive protection for short circuits occurring anywhere on the machine or its trailing cable.
4. Acts to remove power in the event of a broken or open cable conductor.
5. Distinguishes between short circuits and normal operating overloads.
6. Prevents energizing equipment when a dangerous condition exists.
7. Eliminates possible severe arcing that can occur with a ground fault when a grounding conductor is employed.
8. Is essentially "fail-safe."

The device always removes power from the machine *and* its trailing cable. It is designed for use on mobile mining machines to provide complete protection against the electrical faults expected in operation of the machine and cable. This is accomplished without a grounding conductor in the trailing cable. At present, only 250- and 500-V DC models are available.

The complete unit includes a small electronic oscillator unit mounted on the machine, a pushbutton station, also on the machine, and a receiver unit in a safety circuit center at the outby end of the trailing cable. The safety circuit center also includes the customary circuit breaker of adequate capacity for the machine and is equipped with plugs and receptacles for easy cable attachment.

Circuit Arrangement—The accompanying schematic diagram shows the oscillator mounted at the machine and connected across the line ahead of the main contactors (M1, M2) on the machine and through

the normally closed contacts of Relay RY. Application of voltage to the oscillator produces a high-frequency alternating current which is coupled into the trailing cable through the same connections providing power to the oscillator.

At the outby end of the trailing cable, at its connection to Circuit Breaker CB, a capacitor, C, is connected across the line. As far as the high-frequency alternating signal is concerned, C represents a short circuit. Thus, the trailing cable is a closed current loop. A pickup coil, L, tuned to the signal frequency is located within this loop and the signal thus picked up is fed to the receiver and amplified to actuate an electronic switch which energizes the holding coil of Undervoltage Release UV. As long as the signal is present, UV will be energized and CB can be closed and will remain closed. Interruption of the signal for any reason will cause UV to be de-energized and CB will open immediately.

Obviously the signal must be present to close CB, yet it is dependent on applying voltage to the trailing cable. Limiting Resistor R1 and Switch S1, momentary-push type, are provided for bypassing CB with a reduced, or sensing, voltage. Operation of S1 applies sufficient voltage to the cable to produce the required signal and permit closure of CB, thus providing full voltage for the equipment.

Operation—Should an insulation failure occur, resulting in a ground fault anywhere on the machine (cable reel, power or control-circuit wiring, motor windings, etc.), current will flow through the fault, RF, to the machine frame, through the fault-current limiting resistor, R2, blocking Diode D and coil of RY back to the grounded polarity. When a predetermined safe limit is reached, the contacts of RY will open to disable the oscillator and cause CB to open at the outby end of the trailing cable.

Should a dead short, or one of practically zero resistance, occur on the trailing cable or in the machine wiring, voltage at the oscillator is reduced severely and the absence of signal causes CB to open. In addition, CB is equipped with adjustable magnetic trips which also act in this case. A not-so-severe short circuit, 1 or 2 ohms, will not necessarily cause volt-

age to drop nor will it produce enough current to actuate the magnetic trips in CB, since these must be set high enough to withstand motor-inrush current. Yet this short can cause damage if sustained. In this instance, the signal is diverted through the low-resistance path of the short circuit instead of through C and is lost at L, causing CB to open. A break in one or both of the trailing-cable conductors will likewise cause CB to open as a result of loss of signal.

After CB has opened as a result of an occurrence outby M1, M2, it cannot be reclosed until the trouble has been corrected. Should the trouble exist inby M1, M2, CB can be reclosed in the normal manner but will reopen immediately upon closure of M1, M2, until corrected. In the case of an existing short circuit, closure of S1 simply causes line voltage to drop across R1 and the oscillator does not operate. If there is an existing ground fault, closure of S1 will energize RY and the oscillator will not operate. In either situation CB cannot be closed.

A test switch, S2, and a limiting resistor, R3, are provided to produce a simulated ground fault to check operation of the device at any time. An indicator light, N, shows if a ground fault is sustained for any reason. S2 and N are enclosed in a pushbutton station mounted as close as practical to the machine operator. The advantage of S2 for use as an "emergency off" switch to cut off power at the entry is obvious.

Because of the limiting resistor, R1, a low resistance across the line at the time S1 is closed will prevent CB from being closed because of insufficient voltage to the oscillator. Therefore, the headlight switch on the machine must be in the "off" position when attempting to close CB. Once CB is closed, headlight and all other machine controls can be operated at will.

Faults Identified—Because of the versatility of the device in detecting a variety of faults, experience has shown that a means for identifying the nature of the fault is very desirable. For this purpose a voltmeter, VM, and rheostat, R4, are provided and connected as shown. VM has a scale designated "Short Circuit," "Ground Fault" and "Open Circuit." When it is found that CB cannot be

reclosed as a result of trouble, it is only necessary to adjust R4 to bring the pointer of VM to the "Adjust-Line" mark then depress S1 and note the type of fault indicated on the scale.

Application—Any DC mobile mining machine that receives power through a portable cable can be equipped with the new device. Cable can be any type or size, two-conductor, or can be two separate single-conductor cables.

The oscillator panel, approximately 9x5x2³/₄ in. can, in many instances, be mounted within the machine control compartment. Thus a separate oscillator enclosure is not required. This is true of most shuttle cars and many other machines. On machines where there is insufficient space in the existing control compartment, the oscillator panel is available in a separate explosion-tested housing that can be mounted anywhere on the machine.

A separate pushbutton station housing the test switch and indicator light is required for each installation and must be mounted as close as practical to the machine operating controls. The safety circuit center housing the receiver and circuit breaker is located at the outby end of the trailing cable and is connected to the power source in the usual manner.

To simplify specification of correct items for a given installation, packaged units are available, identified by a single number and including all necessary parts for the installation. It is only necessary to specify the machine type, trailing-cable size, system voltage and polarity.

Design Factors, Electrical Specifications

Circuit design permits operation over the wide range of voltages normally encountered with nominal 250- and 500-V DC systems in mines. Approximately 55% of rated voltage is required at the feeder connection to permit closing of the circuit breaker; however, once closed, operation is possible over the approximate range of 50% to 120% of rated voltage.

The operating frequency, approximately 25 kc, was carefully selected as a compromise between lower and higher frequencies. Lower frequen-

cies introduce problems arising out of power-system ripple and hash, and increase the size of certain circuit components. Higher frequencies tend to make trailing-cable length and size critical because of resonance effect and also give rise to possible conflict with communication or monitoring signals in some power systems. The design permits reliable operation on trailing cable lengths to approximately 1,000 ft. Precautions have been taken to confine the signal of each protective device to its own trailing-cable circuit and prevent propagation into the mine power system with possible interaction between two or more units close together.

Ground-fault tripping is based on continuous measurement of machine insulation level, with the circuit R2, D, RY, arranged for operation of RY when potential between the machine frame and grounded polarity of the trailing cable reaches 30 V. This voltage and the resistance values of R2 and RY (coil) result in minimum allowable insulation levels of 10,000 ohms for 250-V operation and 20,000 ohms for 500-V operation.

All electrical parts are of the highest quality, adequately rated for long life and properly mounted for protection in rough service. Components such as power resistors, relays, switches, large capacitors, etc., which are familiar to the mine electrician, are readily accessible for servicing. Approximately 98% of the parts are so arranged that failure of any one will cause equipment shutdown. The remaining few parts that cannot be so handled are carefully selected to reduce possibility of failure to a minimum.

The actual electronic circuits of the receiver and oscillator are contained in plug-in units, hermetically sealed for protection against humidity and physical damage. These are designed for long life and are not intended to be serviced. Certain precautions are taken to protect critical components from line-voltage surges and transients, and to maintain constant voltage on certain portions of the circuit under varying line voltage conditions.

Safety circuit centers used with the device are of the same general construction specifications as other centers familiar to the industry. Units for application on continuous mining

machines include an 800-amp "LM"-frame circuit breaker. Units for other machines incorporate either a 100-amp "G"-frame circuit breaker or 225-amp "K"-frame breaker depending on the power requirements of the machine, based on size of trailing cable used.

The receiver circuit in the protective device is arranged to provide "intrinsically safe control" for use with extension cables in an approved manner where applicable. Safety circuit centers for use with continuous miners are equipped with plugs and receptacles including the pilot contacts for this ISC circuit. If extension cables are not used with the machine the pilot contacts are simply jumpered inside the connecting plugs and safe disconnect thereby gained. Units for other machines normally have the ISC circuit terminals jumpered on the receiver panel and are not equipped with plugs and receptacles with pilot contacts, but are available so equipped if desired.

With the new device it is now possible to operate a mining machine in a safe and approved manner without a grounding conductor in the trailing cable. Interruption of a continuous monitoring signal causes removal of power from the machine and its trailing cable in the event of a ground fault, short circuit, or break in the cable. Energizing the equipment is prevented as long as the trouble exists.

Economically the cost difference between two- and three-conductor cable of a given size is attractive and the advantages of a cable that is smaller, lighter and easier to handle and maintain cannot be overlooked. Conversely, for approximately the same cost, weight, size, etc., a two-conductor cable (or two separate single-conductor cables) of larger copper size can be used for increased carrying capacity and better voltage-drop characteristics.

Loveridge Corrections

In discussing the depth of cover at the new Loveridge mine, December, 1959, the minimum (p 78) was inadvertently given as 50 ft. It should be 500 ft. And in the description of the bands in the seam, p 93, instead of "2½- to 2¾ in," the statement should read "two 1- to 1-¾ in thick slate bands."



Valve bank of coal loader is rebuilt with Aeroquip Hose Lines, quickly and easily made up from Aeroquip Bulk Hose and Reusable Fittings.

**SAYS JIM SAMS, MASTER MECHANIC
GALIS ELECTRIC & MACHINE CO.
MORGANTOWN, WEST VIRGINIA**

Galís Electric, largest mine machinery rebuilding company in the U. S., uses Aeroquip Hose and Reusable Fittings on all of its rebuilt mine equipment.

Aeroquip Flexible Hose Lines absorb the shock and vibration of heavy duty service. They are easily made up, in shop or field, with hand tools. Because the fittings are reusable, they can be used again and again to make up replacement hose lines as needed. You reduce downtime, simplify maintenance and cut costs with Aeroquip Hose Lines. Call your Aeroquip Distributor, listed under "Hose" in your Yellow Pages.

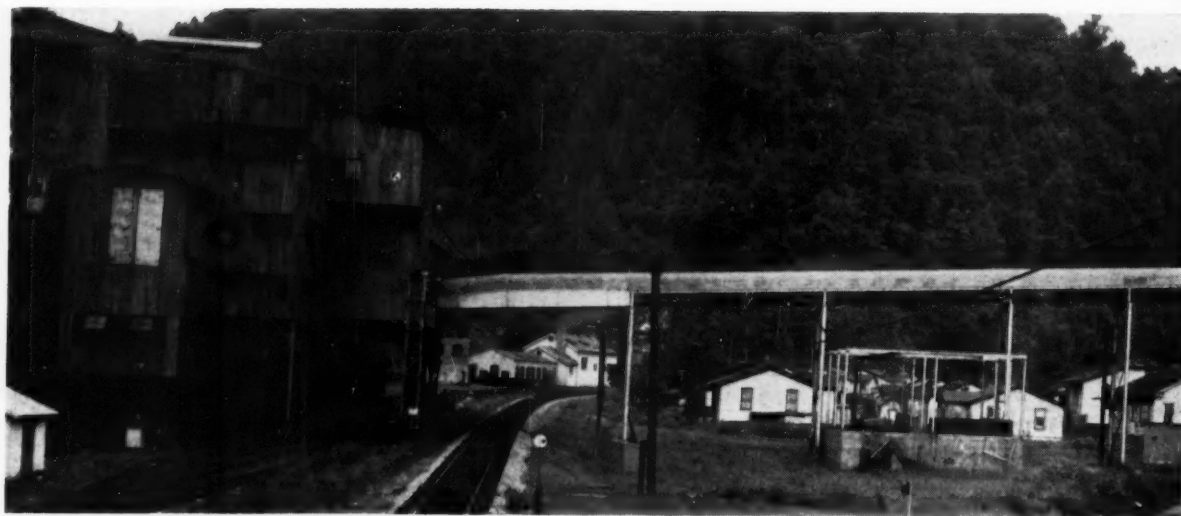
Aeroquip Hose Lines are made up to length as they are needed, eliminating bulky inventories of pre-assembled hose lines.



Aeroquip 1509 Hose, with Reusable Fittings for high pressure hydraulic and air lines (up to 5000 psi, depending on hose size).

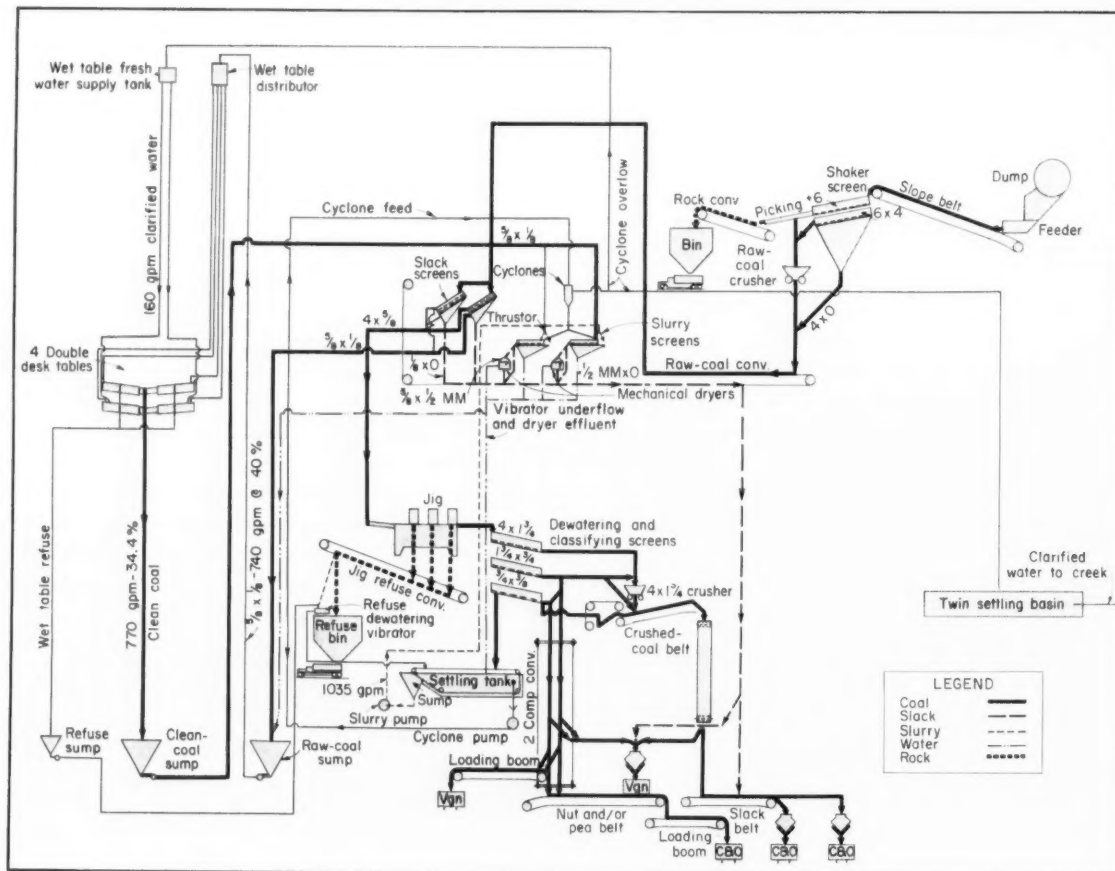
Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN
INDUSTRIAL DIVISION, VAN WERT, OHIO • WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

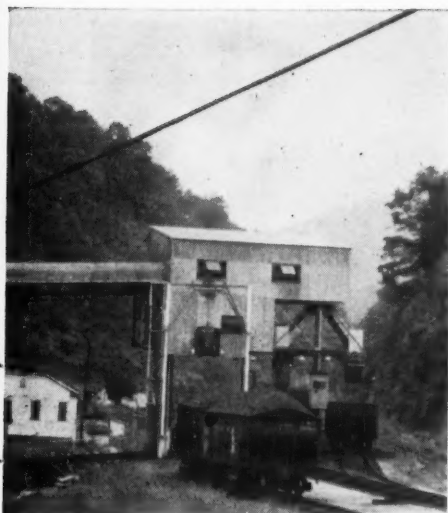


SLAB FORK'S REACTIVATED NO. 2 PLANT and additional loading facilities (right) provide joint rail service and open

Preparation: Quality First—



UPDATED PLANT processes coal from the Pocahontas No. 4 seam. The addition of fine-coal cleaning facilities enhance quality of coal. Sizes normally made include stove, nut, pea and slack which can be loaded on either of two railroads.



new market opportunities for the company.

Service Plus

Enhancement of its market position was Slab Fork's goal in taking its No. 2 plant out of the "mothballs," updating it, providing joint rail service and rounding out the program by modernizing Alpoca also.

REACTIVATION AND IMPROVEMENT of the No. 2 preparation plant of the Slab Fork Coal Co., Slab Fork, W. Va., permits shipping over the Chesapeake & Ohio and the Norfolk & Western Ry. and improves product quality by preparing coals from the Pocahontas No. 4 seam with modern cleaning facilities. The company's Alpoca plant also was updated to improve the quality of fine coal for by-product and metallurgical use. These improvements were aimed at:

1. Expanding coal markets and services.
2. Upgrading products.
3. Adding versatility to the operation.

Catering primarily to the by-product and metallurgical markets, Slab Fork mines the Beckley and Pocahontas No. 4 seams. Annual production, including the company's Gaston mine (Pocahontas No. 3 seam), Alpoca, W. Va., totalled 1,109,887 tons in 1957. The Slab Fork operation accounted for 874,847 tons. Prior to reactivating the No. 2 plant the latter tonnage was processed at the No. 1 plant. Coals from the Beckley and Pocahontas No. 4 seams are now processed separately at the Nos. 1 and 2 plants, respectively.

No. 2 Reconstruction Program

The No. 2 plant was constructed in 1950 for the purpose of opening the Pocahontas No. 3 seam, which is 120 ft below the No. 4. A 595-ft slope

was driven, slope belt installed and plant completed. But because of the '54 recession the operation was temporarily closed soon after production got under way.

The company launched its three-point improvement program at No. 2 in 1957. "After studying the possibilities, we decided that the No. 2 operation would provide the improvements we were seeking—almost as though it was initially planned for that purpose," observed S. A. Caperton Jr., assistant to the president.

Revamping the No. 2 operation called for:

1. Development of a haulageway from the working areas of the Pocahontas No. 4 seam to the No. 2 plant.
2. Installation of a rotary dump, feed hopper, feeder and slope belt to transfer coal from the mine to the plant.
3. Addition of fine-coal cleaning facilities and an increase in the capacity of the original plant.
4. Installation of facilities for loading on the Chesapeake & Ohio.
5. Construction of a disposal system to clarify plant effluent before letting it flow to the nearby streams. (Incidentally, this installation employs a new idea in handling plant effluent, as will be described later.)

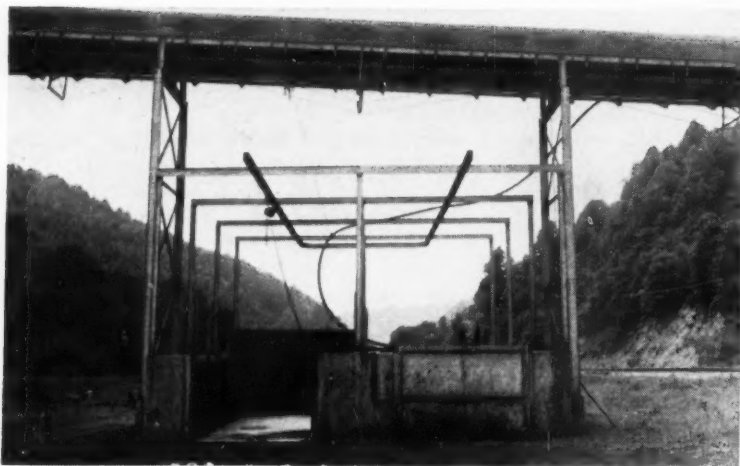
Haulageway—As previously noted, the No. 2 operation was installed to permit developing the Pocahontas No. 3 seam. It was not connected in any way with the No. 4 except that the slope passed through this horizon. The



TWIN BELT CONVEYORS transport coal from plant to new railroad-loading facilities. Belts are 30 and 24 in wide.



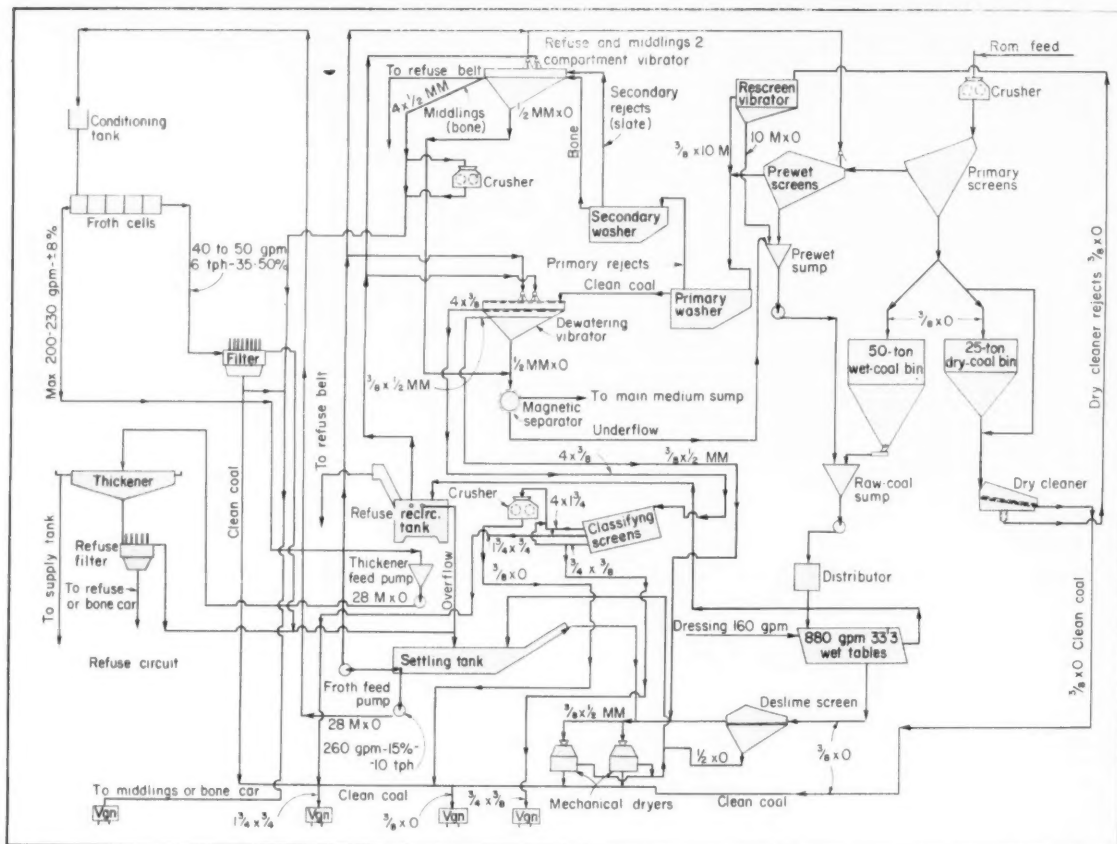
CENTRALIZED CONTROL STATION and modern communication system were installed to increase plant efficiency.



TWO-COMPARTMENT DISPOSAL POND clarifies plant effluent. Effluent in pond is filtered through a network of baffle plates and then discharged into stream.



PERMANENTLY MOUNTED CRUSHER is used to prepare coal samples.



FLOW DIAGRAM shows course- and fine-coal cleaning and water clarification system.

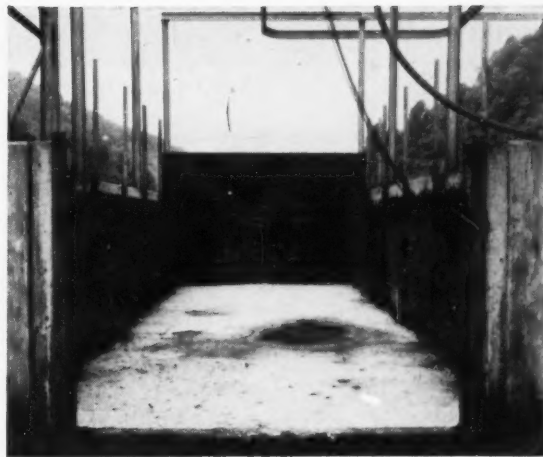
two operations—Nos. 1 and 2—therefore were completely isolated. Consequently, to permit the No. 2 plant to process coal from the No. 4 seam a haulageway was driven from the working sections to the No. 2 slope. The underground distance be-

tween the plants is approximately $1\frac{1}{2}$ mi. Although the Pocahontas No. 4 coal is normally processed at the No. 2 plant it can be handled at No. 1, thus adding versatility to the over-all operation. Fires or similar emergencies would not halt production.

Dumping Facilities Underground— This phase of the reconstruction program was quite simple and required a minimum of work once the haulageway intersected the slope opening. The only required excavation was to enlarge the slope area to accommo-



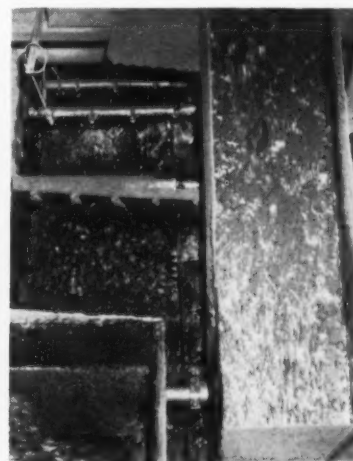
RAILROAD-CAR HOIST and sheave are mounted on an elevated concrete foundation to protect cable. Note belt rollers.



END GATES provide access to pond to permit periodic cleanings. While one pond is being cleaned the other is in use.



NEW PREPARATION FACILITIES installed at the Alpoca plant have enabled Slab Fork to reduce ash content from 7.5% to 5.25% and to keep moisture under 4.5%



DUAL VIBRATOR handles products from primary and secondary washer.

date the car haul, rotary dump feed hopper, feeder and slope belt.

Plant Additions—Major equipment added to improve plant efficiency, increase capacity and produce quality products included: Concenco No. 77 twin-deck tables; extra compartment for the Jeffrey washer, thus making it a three-cell jig for additional capacity; two Jeffrey slurry screens; two Reineveld dryers; three 8-in Heyl & Patterson cyclones; and picking tables, plus associated conveyors and pumps. Additions and changes were handled by the Kanawha Mfg. Co.

Railroad Loading Facilities—The original plant was served by the Virginian Ry. To provide joint rail serv-

ice to customers and to expand its own markets, the company installed loading facilities on the Chesapeake & Ohio. This was possible since the No. 2 plant is located in a valley served by the two railroads. The plant is on the right of the valley (facing downstream) and at the base of the Tams mountain, approximately 12 mi from Beckley, W. Va. The Virginian is on the right side and the Chesapeake & Ohio on the left.

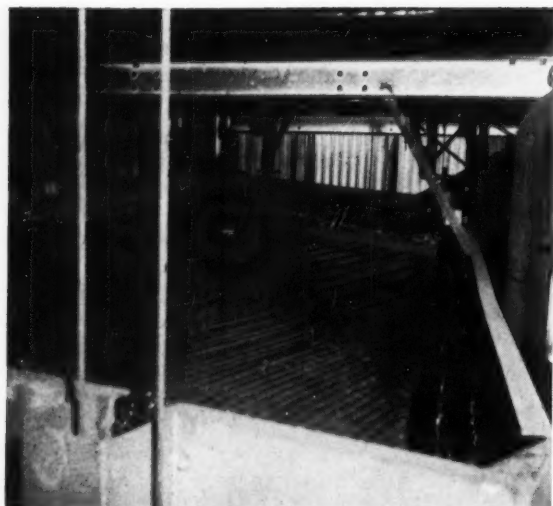
To reach the Chesapeake & Ohio it was necessary to build a steel structure approximately 300 ft long to span the width of the valley (see photo). Two belt conveyors, one 30 in the other 24 in, were then mounted on the structure to carry coal to three loading tracks provided by the railroad.

All coal except slack is boom loaded.

Effluent Disposal—With the added clarification facilities the plant effluent contains approximately 8% solids. Because of this a simple and inexpensive disposal system was designed and constructed.

The installation consists of a concrete pond (see photo) 7 ft high, 24 ft wide and 30 ft long. It is divided into two sections by a concrete wall equipped with overflow ports at 1-ft intervals along its height.

Effluent is discharged into one end of the pond. Baffle plates are installed at intervals along the length and cross-wise of each section to permit solids to settle out. As each baffle-divided compartment fills up the water spills



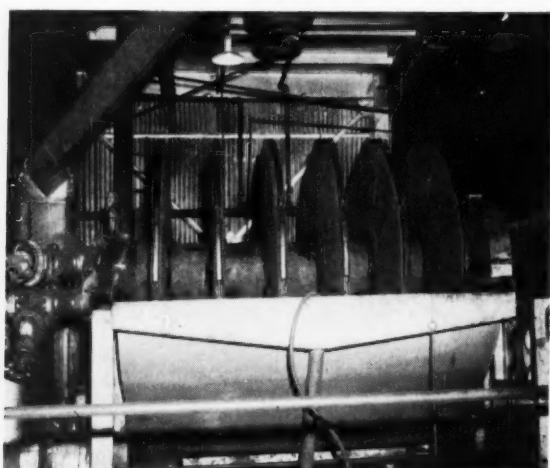
FINE COAL is cleaned on four double-deck tables to upgrade product. One unit is available for increased capacity.



TWO CENTRIFUGAL DRYERS reduce moisture of fine coal from wet tables. Product goes to clean-coal conveyor.



FLOTATION CELLS improve the quality of extreme fines for metallurgical use. Underflow from cells goes to thickener.



VACUUM FILTERS reduce moisture of extreme fines. Filter cake (approximately 6 tph) is conveyed to clean-coal conveyor.



CLEAN COAL from air table is discharged onto conveyor and loaded into railroad cars. Refuse is screened at 10 mesh.



40-FT THICKENER receives underflow from five flotation cells. Underflow from thickener is pumped to a 6-ft 5-disc filter.

into the next compartment. This process continues for the full length of the first section, and then the water flows into the second section through the overflow ports. By the time the water reaches the end of the second section it is relatively free of solids and is re-used as dressing water on the Deister tables.

The pond can be cleaned quickly and easily by removing the baffle plates and end gates. A traveling hoist facilitates their handling. Solids can then be loaded into trucks and hauled away.

No. 2 Preparation Cycle

Coal from the mine is fed onto a 36-in 250-tph belt conveyor which discharges onto a double-deck shaker screen. Plus 6-in goes to a picking table where it is removed by hand. The plus 6-in and the 6x4 from the shaker screen is crushed to 4x0. The crushed product and the 4x0 from the shaker screen is collected on the raw-coal conveyor. Refuse from picking tables is discharged onto a 75-tph conveyor and disposed of by trucks.

The 4x0 is then conveyed to two 6x14 primary vibrators. Separation of 4x $\frac{1}{2}$ and $\frac{1}{2}$ x $\frac{1}{2}$ are made at this point. The larger size is sluiced to the three-cell jig and the $\frac{1}{2}$ x $\frac{1}{2}$ is chuted to a sump. The $\frac{1}{2}$ x $\frac{1}{2}$ is pumped to the four twin-deck tables. The $\frac{1}{2}$ x0 product is conveyed and loaded into railroad cars.

Clean coal from the tables is pumped to two dewatering and classifying screens. Refuse from the tables is pumped to a dewatering screen and discharged into the refuse bin.

Underflow from classifying screens is collected in a settling tank. Slurry from the settling tank goes to the slurry sump and then is pumped to two slurry screens. Top slurry-screen product goes to the two Reineveld mechanical dryers before discharging to the slack conveyor. Water from these dryers, along with the minus $\frac{1}{2}$ -mm product from the slurry screens, is returned to the settling tank.

Effluent from the settling tank is pumped to the three 8-in cyclones. Underflow discharges onto the two slurry screens. Part of the overflow is used as makeup water and is returned to the settling tank. The remainder—approximately 50 gpm—goes to the disposal pond.

Standard sizes made include stove, nut, pea and slack. All sizes however, can be crushed to $\frac{3}{4}$ x0. Any or all sizes produced at the No. 2 plant can be loaded on the Virginian or Chesapeake & Ohio. The plant, which produces an average of 2,500 tpd, operates two shifts and employs five men on the day shift and six on the evening shift.

Alpoca Preparation

With a raw-coal feed of 200 tph and approximately 35% reject the Alpoca plant processes 125 tph of clean coal. Additional preparation facilities including four Concenco No. 77 twin-deck Deister tables, two CMI dryers, five Wemco froth cells, two Eimco filters and a Dorr-Oliver thickener have enabled Slab Fork to reduce ash content from 7.5% to 5.25% and to keep moisture under 4.5%.

The renovated plant involves three major cleaning systems:

1. Coarse coal.
2. Fine coal.
3. Water clarification.

Raw coal from the mine is conveyed up a 486-ft slope by a 36-in belt and then crushed to 4x0 by a primary crusher. Crushed coal is then conveyed to two Allis-Chalmers Ripl-Flo vibrators where a $\frac{1}{2}$ -in separation is made. At this point the coal divides and goes to the three major cleaning systems.

Coarse-Coal Cleaning—The 4x $\frac{1}{2}$ product from the vibrators is conveyed to a 6x16 Lecco low-head prewet screen. Underflow from screen goes to a settling tank. Top coal (4x $\frac{1}{2}$) is discharged into the primary heavy-medium vessel. Washed coal is flumed to a 6x16 drainage screen. A part of the underflow from this screen goes to the primary heavy-medium sump and the remainder to the magnetite separator. Clean coal from the drainage screen is conveyed to a classifying screen for sizing and loading. All sizes can be crushed to slack.

Refuse from the primary heavy-medium vessel is conveyed to a secondary heavy-medium washer where it is subjected to a gravity of 1.58 to produce a utility fuel. This product contains about 14% ash and approximately 4% moisture. The utility coal is then crushed and loaded. Slate is

conveyed to a bin and disposed of by trucks.

Fine-Coal Cleaning — The $\frac{1}{2}$ x0 product from the two Ripl-Flo vibrators at the point where the coal divides is conveyed to two storage bins. One bin is for wet coal, the other for dry coal. Coal from the dry bin is fed to a Roberts & Schaefer Super Air Flow air cleaner. Clean coal is loaded into railroad cars and refuse is screened at 10 mesh. Plus 10-mesh goes to the heavy-medium circuit for recovery and minus 10-mesh is pumped to the wet tables.

The stored dry coal also can be mixed with the raw coal when the R-O-M coal is too wet.

Coal from the wet-storage bin, plus the minus 10-mesh, goes to the four twin-deck tables. Clean coal is dewatered on a 5x16 Lecco vibrator and then mechanically dried in the two CMI dryers. Dried product is conveyed to the clean-coal conveyor.

Refuse from wet tables is reclaimed in a settling tank and conveyed to the refuse bin.

Water Clarification—Products entering the settling tank come from five points throughout the plant:

1. Effluent from the mechanical dryers.
2. Underflow from the 5x16 dewatering screen in the fine-coal circuit.
3. Overflow from the refuse settling tank in the table plant.
4. Underflow from the 6x16 prewet screen ahead of the primary heavy-medium vessel.
5. Overflow from a 6-disc coal filter.

Approximately 250 gpm of effluent is pumped from the settling tank to the five Wemco froth cells and from there to a 6-ft 6-disc Eimco filter. The filter cake (approximately 6 tph) is conveyed to the clean-coal conveyor.

Underflow from the froth cells is pumped to the 40-ft-diameter Dorr-Oliver thickener. Underflow from thickener is pumped to a 6-ft 5-disc refuse filter. The overflow is pumped to a storage tank and used as dressing water on wet tables. Filter cake is conveyed to the refuse bin for disposal.

Approximately 40% of the fine coal is cleaned on the air table and 60% on the wet tables.

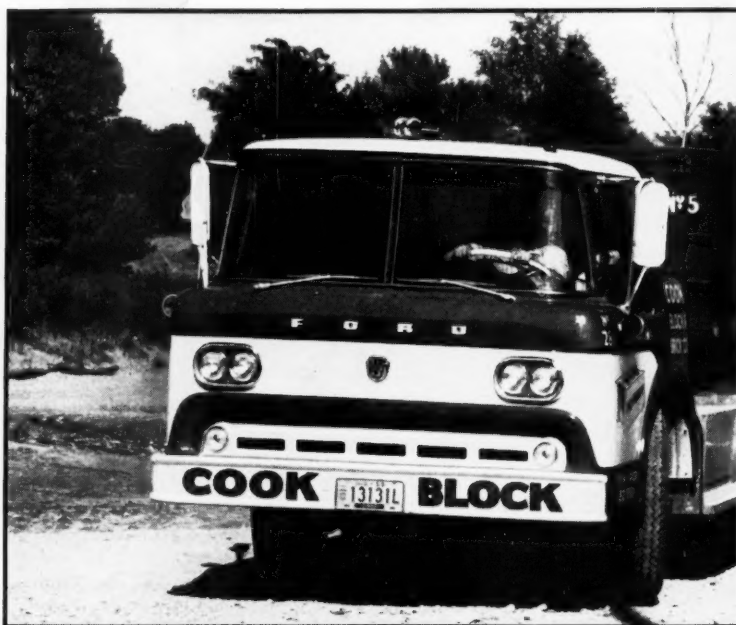
*Here's another reason why Ford Trucks
are your best buy!*

"OF ALL THE MAKES WE'VE TRIED FORD TRUCKS GIVE US THE LOWEST MAINTENANCE COST!"

ANOTHER REPEAT BUYER
OF FORD TRUCKS



Virgil E. Cook, owner of Cook Block and Brick Co., is convincing proof that there is still plenty of opportunity in American business for those sound planning, hard working individuals who want to own their own business. Starting from scratch just 13 years ago, he now owns and operates one of the largest concrete products plants in Eastern Indiana. The workhorses in his fleet of 16 trucks are three Ford Tilt Cab Tandems that are used to haul sand and gravel to the plant and make deliveries in and around Anderson.



Hard-working Ford CT-950 tractor leaves Cook gravel pit with 18 yards of aggregate. Aluminum walking beam and rubber suspension system of tandem axle assembly reduce chassis weight, permit higher legal payloads.



Cook's CT-850 with special flat-bed body and Side-O-Matic unloader delivers blocks right to the job site. Unit carries 600 concrete blocks and spots them where needed.

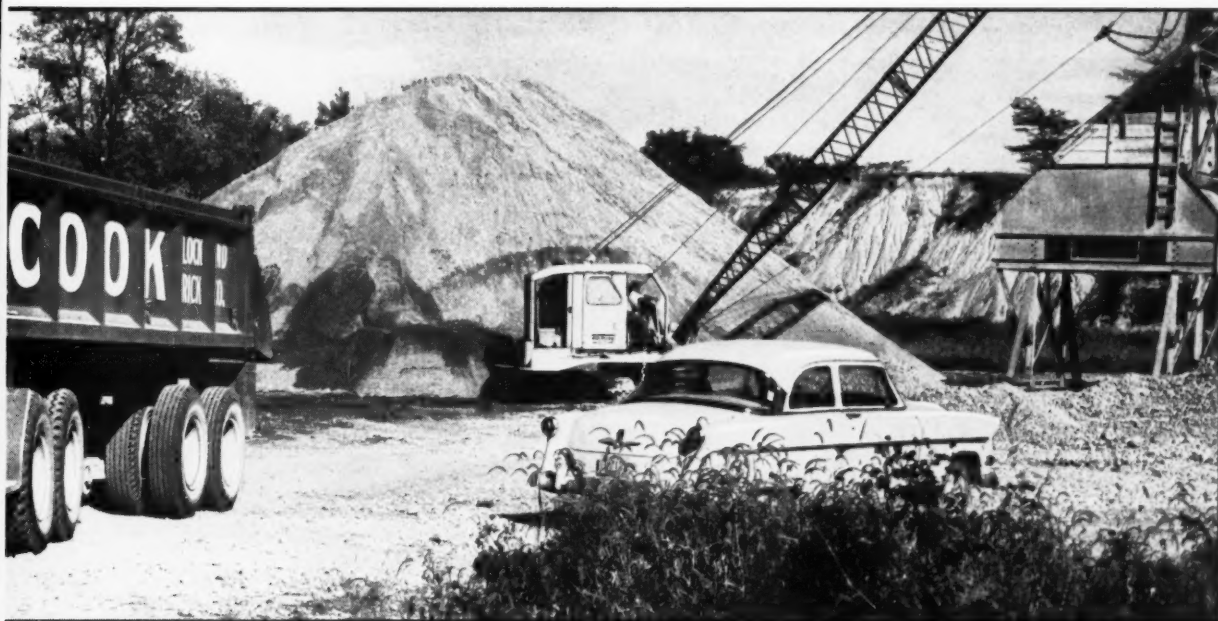
"Our experience has proved that Ford Trucks can be operated at substantially lower maintenance costs than any other make we've tried. And, equally important in a fleet like ours, we find that our Fords spend much less time in the shop. None of the Ford units purchased since 1958 have been in for major repairs and I am still amazed at the way the older ones keep going.

"The best truck we've ever owned is a 1954 Ford C-700 that consistently carries a load of 350 to 400 blocks over all types of terrain. In spite of this severe work it ran 125,000 miles before we replaced the engine. This unit now has over 140,000 miles on the original ring gear and pinion and it went 60,000 miles before we relined the brakes and put in a new clutch. This is outstanding mileage when you consider that we've realized as little as 12,000 miles from competitive ring gear and pinion sets. Clutch and brake life obtained with other makes in identical service was only 20,000 miles. It's results like this that keep our costs low and convinced

us that we should stay with Fords when we bought our bigger trucks in '58.

"Our 1958 and 1959 Ford Tilt Cab Tandems give every indication of equalling or surpassing the fine records set by the C-700. The two CT-950 tractors hauling sand and aggregates to our processing plant breeze through traffic and take the hills like they weren't there at all. Our CT-850 equipped with a flat-bed body has the power and traction to deliver finished products anywhere. With Ford's tilt-cab design we get a real plus as far as payload is concerned because we can carry at least 2,000 pounds more weight on the front axle.

"We buy Ford Tilt Cab Trucks because we think they're the best engineered and most modern gasoline trucks in the heavy-duty field. Here at last is a truck built to permit big legal payloads with enough power to move these loads at economical speeds. We pride ourselves on our modern and efficient equipment and consider our Fords one of the most valuable assets of our business."



'60 Fords are built for longer life . . . with Certified Durability!

Whatever your job . . . wherever you do it . . . you'll discover just as Mr. Cook did, that Ford Trucks are the best investment for your transportation dollar.

Certified results of tests conducted by America's leading independent research organization (name available on request) confirm the fact that Ford Super Duties have been refined for still more durability! Automatic radiator shutters, improved electric fuel pumps and redesigned wiring harnesses are typical of the advancements to be found in these units.

Automatic radiator shutters reduced the coolant temperature variation recorded in severe mountain road

tests from a 79° range to a 20° range. Engine operation with coolant temperatures in the 167° to 187° range means less expansion and contraction, more efficient combustion and better lubrication . . . all of which contribute to longer engine life.

Dynamometer tests showed *no vapor lock* with Ford's submerged-type electric fuel pump at temperatures up to 200°. Incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under the same conditions. Shaker table tests plus constant exposure to oil, water and heat proved 1960 wiring harness to be *three times longer lived*.

FORD TRUCKS COST LESS

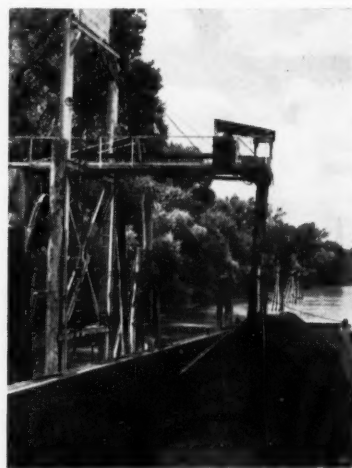
LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!



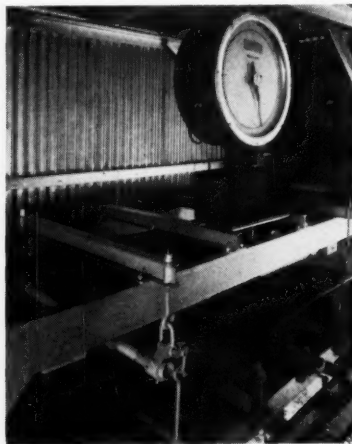
LIEVING MINE AND PLANT, scales and office at right, is characterized by neatness, cleanliness and efficiency.



STEEL BOOMS under a canopy and designed for self-service facilitate sales of domestic sizes.



LIEVING RIVER DOCK includes (left) truck scale and ground storage (not shown), a truck hopper normally employed for receipts, and a second hopper for coal ready for direct loading. Picking and crushing facilities are included, with conveyor loading to the river (right) after weight recording by a conveyor scale.



RECENT DOCK IMPROVEMENTS include loading belt and conveyor scale shown. With 30-in belt capacity of the installation is 200 tph. Major objective, in addition to improved loading, was accurate barge weights.



GROUND-STORAGE SPACE provides reserves for winter demands and is conveniently located immediately across the highway.



R. C. LIEVING (left), superintendent, and **F. E. Skidmore**, office manager.

Moving With the Times

How a 57-year-old domestic operation has operated to take advantage of the new power-plant market via river-loading facilities while continuing to get the most out of available home and commercial outlets.

ORGANIZATIONS with records of over half a century demonstrate, among other things, ability to move with the times and adjust to changing conditions, in addition to constant emphasis on cost, quality and service. In this group is the Lieving Coal Co., of West Columbia, Mason County, W. Va., which has developed a thriving industrial business served by an efficient barge-loading plant to keep mine and working force going without a letdown during a shift from a primarily domestic to a primarily industrial operation. Thus Lieving has been able to get the most out of available domestic prospects while at the same time capitalizing on the opportunities in the barge-served industrial market.

Producing in season approximately 600 to 700 tons per day the present Lieving shaft is the original 50-ft-deep opening sunk by hand in 1903. The entrepreneur was F. B. Lieving, whose son, H. A., is now operating head. Second and third-generation Lievings now active in the organiza-

tion include R. C., son of H. A., mine superintendent, and O. L., a cousin, mine foreman.

Mining and Preparation

The present surface plant was installed in 1947 by Morrow. Usual sizes produced by picking and screening are: mine-run, 4-in lump, 2x4 egg and 1x $\frac{3}{4}$ stoker. These are conveyed to wood storage bins. Three of these bins—lump, egg and stoker—are equipped with self-service booms preceded by rescreening units. Truck purchasers therefore are enabled to procure their coal themselves and loading attendants therefore are unnecessary.

The booms and loading area are protected by a canopy, and the weigh house, presided over by F. E. Skidmore, office manager is conveniently located across the road. Storage facilities also are immediately across then road, and coal is stocked by the same IHC RF-190 trucks with 14-ton Ravens Metal and Penn aluminum bod-

ies used for moving coal to the river and to purchasers' plants or homes.

Storage on the ground site usually gets under way in July, and may include all sizes, with emphasis, however, on lump and egg in anticipation of the winter surge in demand.

Production comes from the Pittsburgh No. 8 seam—primarily from 8-BU loaders feeding to Jeffrey room conveyors, the latter passing the coal to mine cars for haulage and hoisting. Four such face units are normally operated with a fifth as a spare.

A special lump-coal section also is operated with hand loaders to provide 90 to 100 tons of domestic coal per day. It is completely separate from the mechanical sections and the product is specially handled to preserve its quality. Good men, a good supply, haulage and face-preparation setup, and good supervision result in a high output per man from this section.

Cleanliness and neatness characterize the plant, which also is the home of the last of the ponies—now 28 yr old—used in the days before loaders and conveyors were installed. Long since retired, this pony is the recipient of special attention and care by Mr. Lieving and his grandson, Michael. As might be expected from its appearance and the attitude of management the property has had an excellent safety record, with only one fatality in its entire history and a low injury rate throughout.

(Continued on p 102)

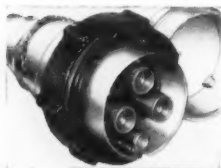
UP TO 7½ kv A-C POWER



*where you need it—
when you need it—SAFELY...*

with handy **PLM** cable couplers

High-voltage a-c power goes to work easily and conveniently to meet today's needs for higher horsepower, when you use PLM plug-and-socket Cable Couplers. Portable power cables can be connected or extended, simply and



SAFE—No exposed connections. Ground circuit is first to close, last to open. No contacts are made until after threaded housings engage.

safely, to bring substation power where you need it, when you need it. Strong but lightweight, watertight cast aluminum housings are built for roughest open-pit or deep mining service conditions. Pressure-molded insulators and electrical and/or mechanical interlocks insure continuity of service, and protect personnel and equipment. Can be applied directly in the field.

Supplied for flange, foot or sled mounting, as plug and socket, or as 2, 3 or 4-way junction box assemblies. Write for bulletin. PLM Products, Inc., 3881 W. 150th St., Cleveland 11, Ohio.

**7½ kv
300-ampere**

PLM

**CABLE
COUPLERS**

River Loading

Foreseeing the rise in river movement of industrial coal, particularly the power-plant variety, Mr. Lieving built a barge-loading plant at West Columbia in 1949 and 1950. This plant is 4 mi from the mine on a black-top road and is designed to accommodate not only Lieving coal but coal from other properties as well. Consequently it can receive and hold eight 900-ton empty barges and a like number of loads. Capacity is 1,400 tons per day with four men, including one at a truck scale for outside coal as well as for checkweighing coal from the Lieving mine.

Wood piles and clusters provide the basic tie-up facilities and accommodate the gear for hoist movement of the barges during positioning and loading. Loading is by fixed-height conveyor and short chute since the loading usually is natural screenings and crushed coal.

Bank facilities comprise a Howe truck scale and a hopper for direct truck dumping, if desired, of coal that has already been cleaned. This hopper can feed into a crusher or the coal can be bypassed directly to the loading conveyor.

Ground Storage

For outside coal, especially, a separate dump hopper and ground storage facilities have been provided. If coal is being loaded trucks can dump directly to the hopper. If not, the coal can be put on the ground and moved to the hopper by bulldozer as convenient. A belt moves coal from this hopper to the crusher. A picking station along it permits hand cleaning. From the crusher the coal goes to the barge-loading conveyor.

The loading conveyor—a 30-in belt unit 100 ft long, provided by Kremser—is part of an improved weighing-loading addition completed early in 1959. The major objective was a specific and more-accurate record of the weight per barge, not only for Lieving's benefit but the benefit of the purchaser. The objective was achieved by the installation, with the new loading conveyor, of a Conveyco conveyor scale supplied by the Howe Scale Co., Rutland, Vt., a subsidiary of Safety Industries, Inc. Capacity of the installation is 200 tph and a check on accuracy is provided by the 20-ton Howe truck scale. Cost of the conveyor scale was less than \$4,000.



GET TOUGH

WITH LUKENS "T-1" STEEL

TRADEMARK

Where the going gets rough, versatile Lukens "T-1" steel fights back. For repair or modification of heavy duty equipment such as truck beds, chutes, bucket teeth and dozer blades, this special duty steel plate can be ordered from warehouse stock in a wide range of plate sizes and gages. Lukens "T-1" is the modern mining steel—you can work and weld it in the field as readily as in your shop. Its terrific

resistance to abrasive impact—coupled with an extremely high yield strength—means fewer replacements and often greater payloads. That's why more and more equipment builders are using Lukens "T-1" to provide longer life in shovel buckets, trucks and other mining equipment. Remember to specify the extra-tough 321 min. BHN quality. For performance and application details, request our special booklet, "Lukens 'T-1' for Toughness." Address Manager, Application Engineering Dept., M10 Services Bldg., Lukens Steel Company, Coatesville, Pennsylvania.

You can order
Lukens "T-1"
steel plate
from these
Steel Service
Centers:

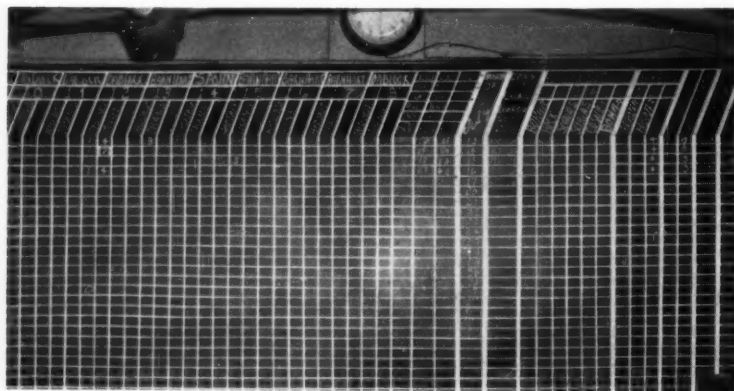
Alabama, BIRMINGHAM 2, O'Neal Steel, Inc., P.O. Box 2623 • California, LOS ANGELES 54, Earle M. Jorgensen Co., P.O. Box 2358, Terminal Annex, 10650 S. Alameda St. • LOS ANGELES 33, The R. J. M. Company, 238-248 South Mission Rd. • Illinois, CHICAGO 8, Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts. • Kentucky, ASHLAND, Mansbach Steel Co., 19th St. and River Front • Maryland, BALTIMORE 2, Wm. G. Wetherall, Inc., 317 President St. • New Mexico, ALBUQUERQUE, Miller and Smith Mfg. Co., Inc., 500 Phoenix Ave., N. W. • Ohio, CLEVELAND 6, Mills-Wolf Steel Co., 12434 Cedar Rd. • Oregon, PORTLAND 4, J. E. Haseltine & Co., 115 S. W. Second Ave. • Pennsylvania, MCKEES ROCKS, Follansbee Steel Co., 200 Bradley St. • Quebec, MONTREAL, Drummond, McCall & Co., Ltd., 930 Wellington St. • Utah, SALT LAKE CITY, Structural Steel & Forge Co., P. O. Box 300 • Washington, SEATTLE 4, Stack Steel & Supply Co., 500 Landers St. • SPOKANE 10, Union Iron Works, East 217 Montgomery Ave., P. O. Box 2135.





MAINTENANCE SUPERVISORS are (left) Clyde Goodlin, outside master mechanic; L. W. Leedy Jr., assistant general manager in charge of maintenance; and H. L. Sowers, underground master mechanic.

A good preventive maintenance program goes hand-in-hand with increased production and lower cost per ton for mined and prepared coals. Recognizing this the management team of Delmont Fuel designed their own program to achieve these benefits. Here's how they did it and also how it works.



Lubrication: Key Factor in PM Program

CONSIDERABLE TIME and effort was involved in organizing and putting in effect a complete lubrication program at Delmont Fuel. The results of this program alone have lowered lubrication costs—labor and material—to a remarkable 2c per ton.

H. L. Sowers, underground master mechanic, is credited with setting up the program. He designed and established

a system of records and reports which permits keeping tabs on the amount of hydraulic oil used in each machine, and the amount and types of grease required on equipment. The forms provide a quick and simple method for keeping accurate daily records of the consumption of hydraulic oil for all loaders and cutting machines, and also aid in controlling the amount and use of greases.

Putting

A CUT IN MONTHLY MAINTENANCE DELAYS to less than 10% and a significant reduction in labor and supply costs are direct results of a company-planned preventive-maintenance program at Delmont Fuel Co., Hunkers, Pa. Lubrication cost, for example, has been reduced from 5c per ton to 2c. Seventy-two major equipment items, plus associated units, operating three shifts daily, are maintained by an underground crew of 17 mechanics. Maintenance of the preparation plant, which has a two-shift daily capacity of 4,000 tons, is handled by a four-man crew.

Delmont's PM program is outstanding not only because it has achieved a high degree of efficiency which enables the company to enjoy the benefits that a good program provides but also because it was designed and set up by men within the company. Those responsible for setting up the program and also making it work are: L. W. Leedy Jr., assistant general manager in charge of maintenance; H. L. Sowers, underground master mechanic; C. W. Goodlin, outside master mechanic;

The Hulburt Oil & Grease Co. assisted Delmont Fuel in selecting lubricants for different applications. The combined efforts of these companies reduced the number of lubricants that the mine now uses to three. These include two of Hulburt's AP greases and hydraulic oil. Incidentally, Delmont Fuel is now using a new fire-resistant hydraulic fluid produced by Hulburt.

Hydraulic Oil—Responsibility for the consumption of hydraulic oil for loading machines is delegated to the three major repair-inspection mechanics. This same responsibility for cutting machines is placed in the hands of the production-unit mechanics.

The amount of oil used in each machine is noted on the mechanic's daily report. This information is then transferred to a blackboard located in the maintenance office (see photo above).

At the top of the board are the names of the three mechanics responsible for oil consumption of loaders. The column under the mechanic's name designates the company number of each loader.

Preventive Maintenance to Work

and Bill Yezek, preparation maintenance foreman.

The development of such program reflects ingenuity and determination on the part of the staff and proves that small- and medium-sized companies can design effective PM programs without spending large sums of money. Delmont's management team believed that a good PM program would be as beneficial to their operation as it has proven to be for large companies. This belief has been substantiated by the company's present-day program—in many respects much more than anticipated.

Maintenance Problem

The PM system was initiated in 1956 as one of several steps in the company's modernization program. At the time the program was set up production crews were on a four-shift schedule, thus making it necessary for all maintenance to be performed during production hours and off days.

This rather unusual schedule for a 24-hr period was as follows: 12:00

midnight to 8:00 am; 6:00 am to 2:00 pm; 12:00 noon to 8:00 pm; and 6:00 pm to 2:00 am. Each oncoming shift started into the mine 2 hr before the one-shift crew was due outside at the portal. Travel time for both crews, and section supplying and general upkeep of section by the oncoming shift, consumed the 2-hr overlap.

This schedule has since been changed to three shifts. Maintenance, however, still has to be performed during production hours. Consequently, the change had little effect on the original setup.

Educational Program—“Troubleshooting electrical and hydraulic malfunctions in our equipment had been, in most cases, a more time-consuming factor than actual repair,” notes R. H. Jamison Jr., president. “To improve efficiency in diagnosing and taking care of such trouble, we decided that classroom instructions would be the answer.”

James L. Tenley, chief engineer, planned and conducted a 32-wk course in electricity and hydraulics.

Sixteen weeks were devoted to each subject. The course included basic principles of circuit analysis for the most complex machines the company is using today. Text books, literature and visual aids were furnished by the company through the facilities of the Mineral Industries Extension Service, Pennsylvania State University.

Mine Setup—The mine has three producing sections including a double unit with 11 men, plus foreman; a single unit with eight men; and shuttle-car unit with seven men.

Major equipment for the double unit consists of five 8 BU Joy loaders, 10 RU and 11 RU Joy cutting machines, four PT 12 Long bridge conveyors, two belt conveyors, compressor, Stamler car spotter, Cleveland roof-bolter and six chain conveyors. The single unit has three loaders, one cutter, two bridge conveyors, roofbolter, three chain conveyors, two belt conveyors, air compressor and car spotter. The shuttle-car unit has a loader, cutter and two shuttle cars.

Directly under this is noted the hydraulic system and the transmission gear case. The small squares represent the day of the month. When oil is added to a loader it is entered in these squares.

Totals are kept of the amount of oil added to hydraulic systems to date, transmission gear case to date and total oil added to each 8BU loader to date. The same system is used for cutting machines.

If a loader, for example, used an excessive amount of oil in one day, or for several days, the mechanic responsible for that loader would be required to report the cause or causes.

By determining the various causes for large consumptions of oil over a long period of time and after sufficient data were collected to justify corrective measures, the company took steps to eliminate or reduce the causes. The steps included in the program thus far are:

1. Scheduled inspection of all hydraulic components, such as hoses, fittings, pumps, motors, valves and jacks. This must be done every 48 hr on loaders as a part of the routine inspection

schedule. When large consumptions of oil are reported for any one loader this step also is taken as soon as the report is received in the maintenance office.

2. Routine tests of the hydraulic system are made every 2 mo. A Schroeder FPT hydraulic tester is used to measure flow, pressure and temperature of the over-all system. Corrective measures are taken when abnormal conditions are found to exist.

3. Filtering of the oil in the hydraulic system of all machines at least three times a year. A Schroeder line filter is used for this purpose.

The selection of hydraulic oil was based on the various conditions to which the hydraulic mechanisms are subjected. Delmont selected an oil that provided:

1. Resistance to oxidation.
2. Protection against rust.
3. Resistance to catalyzation by brass, steel, bronze, or copper.
4. Antifoaming action.
5. Properties to withstand sudden shock pressures.

6. Sufficient film strength to prevent pump and valve wear.

Greases—In like manner, the selection of greases was based on the conditions to which the mechanical components are exposed. The two greases selected fulfilled these requirements. The properties that the greases possess and also what the company wants most in its lubricants are:

1. Mechanical stability.
2. Structural stability.
3. Water resistance.
4. Thermal stability.
5. Rust inhibition.
6. Oxidation inhibition.
7. Compatibility.
8. Lubricity.

To simplify lubrication procedure and to insure that all lubrication points on equipment are being serviced correctly, Hulburt provided lubrication charts (see illustration) which mechanics use until they are thoroughly trained in the all-important phase of equipment lubrication.

Maintenance Ideas

LOADING MACHINE NO. _____

Mechanic _____

Type _____ **Serial No.** _____ **Section** _____ **Week** _____

- Gathering Head**
 - a — Drive-gear box
 - b — Drive chain
 - c — Gathering-head pots
 - d — Gathering-head brackets
 - e — Food shaft
 - f — Conveyor chain
 - g — Hingepin
 - h — Universal coupling
 - i — Swivel arms
 - j — Crank discs
- Transmission**
 - a — Cover
 - b — Conveyor-clutch linkage
 - c — Conveyor-clutch housing
 - d — High-low shift linka
 - e — Drive-axle oil seals
 - f — Drive-sprocket brake drums
 - g — Drive-axle housings
 - h — Brake assemblies
- Friction Clutches**
 - a — Conv.-No. threads showing
 - b — Forw.-No. threads showing
 - c — Rev.-No. threads showing
- Tramming**
 - a — Cat chain
 - b — Cat-chain runners
 - c — Cat-chain sprockets
 - d — Cat-chain idlers
- Boom Section**
 - a — Hinge pins
 - b — Roller
 - c — Conveyor-chain takeups
- Motor**
 - a — Brushes
 - b — Brush holder
 - c — Commutator
 - d — Wiring
- Controller**
 - a — Contactors
 - b — Time tactors
 - c — Overload
 - d — Wiring
 - e — Mounting bolt
 - f — Mounting-bolt holes
- Control Station**
 - a — Start switch
 - b — Stop switch
- Resistance Compartment**
 - a — Resistance
 - b — Wiring
- Power Take-Off**
 - a — Wiring
 - b — Circuit breaker
 - c — Shunt trip
 - d — Receptacles
 - e — Terminal insulator
- Trailing Cable**
 - a — Fuse nip
 - b — Fuse size
 - c — Number splices
 - d — Condition splices
 - e — Cable support
 - f — Cable protective hose
- Hydraulic System**
 - a — Pump pressure
 - b — Head jacks
 - c — Boom
 - d — Aux. boom jacks
 - e — Hose connectors
 - f — Control valve
 - g — Leveling jack

CUTTING MACHINE NO. _____

Mechanic _____

Type _____ **Serial No.** _____ **Section** _____ **Week** _____

- Trailing Cable**
 - a — Fuse nip
 - b — Fuse size
 - c — No. splices
 - d — Condition of splices
- Cable Reel**
 - a — Strain clamp
 - b — Drive chain
 - c — Reel wind release cable
- Wheel Units**
 - a — Left drive
 - b — Right drive
 - c — Left steer
 - d — Right steer
- Steering**
 - a — Jack linkage
 - b — Spindles
- Tramming**
 - a — Drive chains
 - b — Gear boxes
 - c — Brake bands
 - d — Brake linkage
 - e — High-low shift linkage
- Cutter Chain**
 - a — Chain tension
 - b — Dead blocks
 - c — Bar wear
 - d — Block arrangement
 - e — Sprocket
- Universal**
 - a — Bearings
 - b — Cap screws
 - c — Clearance
- Jacks**
 - a — Boom lift R.H.
 - b — Boom lift L.H.
 - c — Boom swing R.H.
 - d — Boom swing L.H.
 - e — Bar swing R.H.
 - f — Bar swing L.H.
 - g — Bar tilt
 - h — Steering
- Cutting Motor**
 - a — Brushes
 - b — Brush holder
 - c — Commutator
 - d — Wiring
- Pump Motor**
 - a — Brushes
 - b — Brush holder
 - c — Commutator
 - d — Wiring
- Controller**
 - a — Contactors
 - b — Time tactors
 - c — Overload
 - d — Switches
 - e — Circuit breaker
 - f — Wiring
- Hydraulic System**
 - a — Small pump pressure
 - b — Large pump pressure
 - c — Steering circuit
 - d — Boom roll circuit
 - e — Low tram circuit
 - f — Cable reel circuit
 - g — High tram circuit
 - h — Bar tilt circuit
 - i — Bar swing circuit
 - j — Boom lift circuit
 - k — Boom swing circuit
 - l — Coal drill circuit

SHUTTLE CAR NO. _____

Mechanics Name _____ **Date** _____ **Section** _____

- Trailing Cable**
 - a — Fuse nip
 - b — Fuse size
 - c — No. splices
 - d — Ground conductor
- Cable Reel**
 - a — Collector rings
 - b — Sprocket chains
 - c — Spooler
 - d — Motor
- No. 4 Wheel-Drive Unit**
 - a — Wheel bolts
 - b — Friction clutch
 - c — Trunnion
 - d — Gear box
 - e — Tire
- Universal Drive Shafts**
 - a — No. 1 shaft bearings
 - b — No. 2 shaft bearings
 - c — No. 1 shaft bolts
 - d — No. 2 shaft bolts
- No. 3 Wheel-Drive Unit**
 - a — Wheel bolts
 - b — Friction clutch
 - c — Trunnion
 - d — Gear box
 - e — Tire
- No. 2 Traction-Drive Unit**
 - a — Motor
 - b — Reduction gear box
 - c — Brakes
 - d — Universal bearings
 - e — Universal bolts
- No. 1 Traction-Drive Unit**
 - a — Motor
 - b — Reduction gear box
- Brakes**
 - c — Brakes
 - d — Universal bearings
 - e — Universal bolts
- No. 2 Wheel-Drive Unit**
 - a — Wheel bolts
 - b — Friction clutch
 - c — Trunnion
 - d — Gear box
 - e — Tire
- Electrical Circuits**
 - a — Panel wiring
 - b — Fuse
 - c — Contactor tips
 - d — Master control switches
 - e — Control station switches
 - f — Headlight circuit
- No. 1 Wheel-Drive Unit**
 - a — Wheel bolts
 - b — Friction clutch
 - c — Trunnion
 - d — Gear box
 - e — Tire
- Hydraulic System**
 - a — Pump
 - b — Hose
 - c — Control valve
 - d — Jacks
- Conveyor-Drive Unit**
 - a — Motor
 - b — Reduction gear box
 - c — Universal coupling
 - d — Worm gear box
- Conveyor Chain**
 - a — Tension
 - b — No. flights missing

Check monthly	Check every two weeks	Check weekly
2-d 12-a	9-a 9-e	1-c
6-a 12-b	9-b 9-f	3-c
6-b 2-a	9-c	11-c
7-a 2-d	9-d	13-a
7-b		13-b

All the other items will be inspected daily.

CONVEYOR TYPE _____

Mechanic _____

- Motor**
 - a — Frame No.
 - b — Serial No.
 - c — Brushes
 - d — Wiring
 - e — Bearings
- Speed Reducer**
 - a — Make
 - b — H.P.
 - c — Coupling
 - d — Bearings
 - e — Oil seals
- Head Frame**
 - a — Type
 - b — Shaft assembly
 - c — Drive chain
 - d — Drive-chain sprockets
 - e — Shearing hub
 - f — Head pan
 - g — Bearings
- Starter**
 - a — Fuse nip
 - b — Fuse size
 - c — Wiring
 - d — Overload
 - e — Contactors
 - f — Resistance

MISCELLANEOUS

Section _____ Mechanic _____ Week _____

SUPPLY BUGGY NO. _____

1. Trailing Cable

- a _____ Fuse nip
- b _____ Fuse size
- c _____ No. splices

2. Controller

- a _____ Contactors
- b _____ Wiring
- c _____ Fuses

3. Traction

- a _____ Motors
- b _____ Gear reductions
- c _____ Universals
- d _____ Worm-gear boxes
- e _____ Wheel units

4. Steering

- a _____ Tie rods
- b _____ Reversing arms
- c _____ Drag links
- d _____ Trunnion arms

5. Hydraulic System

- a _____ Pump motor
- b _____ Steering jack
- c _____ Control valve
- d _____ Hose connections

AIR COMPRESSOR

1. Starter

- a _____ Fuse nip
- b _____ Fuse size
- c _____ Wiring
- d _____ Overload
- e _____ Contactors
- f _____ Resistance

2. Motor

- a _____ Brushes
- b _____ Belt tension

3. Compressor loads _____lb

Compressor unloads _____lb

CAR SPOTTER

1. Motor

- a _____ Brushes
- b _____ Wiring
- c _____ Bearings

2. Starter

- a _____ Fuse nip
- b _____ Fuse size
- c _____ Wiring
- d _____ Overload
- e _____ Contactors
- f _____ Resistance

3. Ropes

4. Sheaves

5. Hydraulic connections

6. Barneyes

EQUIPMENT FAILURE REPORT

No. _____ Type _____ Operator _____

Date _____ Shift _____ Section _____ Mechanic _____

Broke down at _____M Ready to work at _____M

Name of part that failed _____

Describe nature of breakdown _____

Are repairs complete? _____ If not, what should be done to make them complete? _____

Name of mechanic incomplete repairs reported to _____

New parts used on this breakdown

1 _____ Cat. No. _____ Cost _____

2 _____ Cat. No. _____ Cost _____

3 _____ Cat. No. _____ Cost _____

4 _____ Cat. No. _____ Cost _____

5 _____ Cat. No. _____ Cost _____

6 _____ Cat. No. _____ Cost _____

7 _____ Cat. No. _____ Cost _____

8 _____ Cat. No. _____ Cost _____

Checked by _____

STANDARD EQUIPMENT REPORTS are designed to keep writing and time for filling them out to a minimum. Inspection reports for loaders, cutters, shuttle cars, conveyors, supply buggies, air compressors and car spotters are included in the PM program. This program also uses an equipment-failure report and a mechanic's daily worksheet for maintenance control purposes.

Maintenance Program

Unlike operations where preventive maintenance is performed on the third shift—when production crews are idle—Delmont's program had to be designed to keep maintenance activities from interfering with production because of the three-shift schedule. Therefore, a comprehensive study of personnel placement, work allocation and work schedules was made to avoid such conflicts.

Personnel Placement—With the three-shift schedule the maintenance department, by necessity, had to perform its duties during production hours and on off days. Therefore, mechanics had to be stationed on

each section on each production shift. The underground maintenance force was divided into four groups totalling 17 men, as follows:

12 production-unit mechanics.

Three major repair-inspection mechanics.

Moving-crew mechanic.

Belt-conveyor mechanic.

Two production-unit mechanics are assigned to the double unit and one to each of the other units. Major repair-inspection mechanics are employed on the day shift only.

The moving-crew mechanic is a permanent member of a moving crew and the belt mechanic takes care of all belt conveyors on the day shift.

Work Allocation—This phase of the program presented another problem since there would be as many as three mechanics on one section, for example, taking care of the same equipment at different times—six mechanics in the case of the double unit. Mechanics would not know what they should do in the way of

MECHANICS REPORT

Name _____ Date _____ Section _____

LUBRICANT USED

No. _____ 8BU Hyd. Sys. _____gal. Trans. _____gal. Pots _____lbs. Bearings _____lb.

No. _____ " " " _____gal. " " " " " " " "

No. _____ 10RU " " " " Gear boxes " " " "

No. _____ " " " " " " " " " "

REPAIRS AND MISCELLANEOUS

Job No. 1 _____

Job No. 3 _____

Parts Used _____

Parts Used _____

Time _____

Time _____

Job No. 2 _____

Job No. 4 _____

Parts Used _____

Parts Used _____

Time _____

Time _____

Maintenance Ideas

preventive maintenance or, for that matter, other forms of maintenance, since they would have no way of knowing what the two mechanics on the previous shift had done. Consequently, the department adopted an individual equipment-assignment program.

The purpose of this program was to assign each mechanic specific equipment which he alone would take care of. In other words, he would perform all preventive-maintenance requirements, such as, lubrication, inspection, etc., on the equipment assigned to him.

Each mechanic, therefore, is responsible, from a "preventive-maintenance" standpoint, for approximately one-third of the equipment on his section. The remaining two-thirds also is under his care during his shift but only on a routine and emergency-repair basis.

The equipment-assignment program has several advantages as follows:

1. Pinpoints mechanic's responsibilities and duties.
2. Eliminates buck-passing.
3. Provides additional assurance that equipment receives the attention it needs during each 24-hr work period, including daily and weekly inspections, proper lubrication and routine repair work.

This program also has given mechanics a personal sense of pride and has stimulated their desire to keep equipment in good condition.

Work Schedule—The daily work schedule for mechanics consists of making all repairs and inspections that can be completed within 20 min since that is the minimum time interval in the production cycle that equipment is idle. If a job requires more time and it is not an emergency or absolutely necessary it is held over until the weekend.

Saturday is set aside to make all major repairs and special inspections on equipment. This includes inspections not completed by mechanics during the regular work week, time-consuming inspections which are performed only on Saturday and repairs which would have exceeded the 20-min time limit.

At the end of each work week, maintenance supervisors review all inspection records and mechanic's daily reports. These records and re-

ports provide necessary information for setting up the maintenance work schedule for Saturday.

Equipment Inspection—Major equipment included in the company's inspection program for which standard forms are provided totals 72 units. These units, as previously noted, are assigned to mechanics who are directly responsible for the upkeep of their equipment.

Mechanics must answer directly to supervisors on matters—good or bad—concerning their equipment. This also enables management to recognize mechanics that are doing good work as well as criticize those for below-standard maintenance.

Major units included in the equipment-assignment program are: loaders; cutting machines; shuttle cars; chain, belt and bridge conveyors; supply buggies; air compressors, and car spotters. Equipment not listed in this group is classified in a general maintenance schedule under which all mechanics share the maintenance responsibility.

Reports and Records

A minimum number of records and reports are used at Delmont Fuel to control the maintenance program. Those used are designed to limit the amount of writing and time required to complete them by providing space for a check mark if component is okay and an X mark if it needs attention. Explanations for needed repairs are made on the backs of the report forms.

Loading Machine Report—This inspection report is classified into 12 sections (see accompanying illustration).

The inspection schedule for loaders requires that they be taken out of service every 48 hr for a 24-hr period. An investment in three additional SBU's over the original number permitted this changeout. During this period they are given a complete inspection. Needed repairs also are made at this time. If inspections and repairs are not completed in the allotted time they are held over for the next inspection or completed on Saturday.

Loading machines are assigned to the major-repair-inspection mechanics. Although their main responsibility

is to maintain loading machines they may at times be required to assist production-unit mechanics during emergencies or on special jobs.

Cutting Machine Report—This report is similar in style to the loader report with the 12 classifications pertaining to the various components of the cutter.

Weekly inspections are made during the production shift and on weekends. Since certain components require considerable time for thorough checking it is necessary to defer these components to the weekend. Those components which can be inspected and repaired easily and quickly—within the 20-min time limit—are taken care of during the shift.

Production-unit mechanics maintain cutting machines and it is up to them to see that their machines are properly serviced.

Shuttle-Car Report—This report is made on a weekly basis with certain components requiring bi-weekly and monthly checks. It also is essential that critical items, such as universal drive shafts, trailing cables, etc., be inspected daily (refer to inspection form for a complete breakdown).

The report form is broken down into 13 sections and includes instructions as to how often components are to be inspected. Most of the components, except those requiring daily checks are inspected on Saturday rather than during the week.

Shuttle cars are assigned to production-unit mechanics. In some cases the shuttle-car operator assists or assumes full responsibility for general maintenance.

Conveyor Report—This report is used for chain, belt and bridge conveyors and includes inspection data for motor, speed reducer, head frame and starter.

A production-unit mechanic may be assigned as many as four chain or bridge conveyors. Inspections are made during the week since conveyors, generally, are idle during part of each production shift, thus providing ample time to inspect and make repairs.

Belt conveyors are maintained by one man who is constantly checking, lubricating and making repairs as necessary. These conveyors are remotely controlled and unattended.

Miscellaneous Report—This report contains data for supply buggies, air compressors and car spotters.

Supply buggies are inspected and lubricated during the shift. Repairs also are made at this time.

Air compressors are inspected and lubricated every 24 hr. Major repairs normally are made on Saturday.

Car spotters are inspected during the shift. Time-consuming repairs are made on Saturday if the nature of the repairs permit; otherwise they are made on the spot.

Equipment-Failure Report—Breakdowns of as little as 2 and 3 min are reported. In each case the number and type of machine, operator's name, date, shift, section and mechanic's name are recorded. The time the breakdown occurred and when the machine was ready for production also are recorded.

Name of part that failed and the nature of the delay is described in detail. Space is available for the mechanic to indicate whether the repair was completed on his shift and, if not, to let the on-coming mechanic know what needs to be done to complete the job. When a repair job is passed from one mechanic to another each mechanic's name must be included in the report.

Each part used in making the repair is listed giving name, part number and cost. This report is then filed as part of the equipment-history record of that machine.

Equipment-History Record—An individual history is kept on all major equipment. These records are used, in part, to determine when a particular machine should be overhauled. Total downtime, parts and labor costs and other information for any period can be obtained from these records.

A scheduled-overhaul system is not included in the program at Delmont Fuel. Management feels that the equipment-history records provide a more accurate method of determining when a machine should be overhauled. An equipment-overhaul schedule, they feel, normally does not take into account the different mining conditions that, for example, three loading machines might be working under, how different operators handle their machines and the way different mechanics maintain the loaders.

Mechanic's Daily Worksheet—Each mechanic is required to fill out a daily worksheet. The worksheet has space for describing each job that was completed and also for those started but not completed, travel time and lunch period. The total time should add up to 8 hr.

Other PM Features

A list of essential repair parts was prepared for each of the three sections. Separate lists were necessary since the amount and type of equipment varied on each section. Sections are equipped with supply boxes for storing as many as 68 items having a value of approximately \$4,000.

When spare parts are used the mechanic making the repairs must see to it that they are replaced. This is done by reporting parts used to the oncoming shift mechanic and also listing them on the daily worksheet. The mechanic on the following shift then requisitions the parts from the supply house and personally takes them to his section.

A scheduled check of voltage and power demands is made every 2 wk on each section. The company uses Esterline-Angus graphic ammeters and voltmeters for this purpose. These instruments are placed on the section to record conditions for a 36-hr period. If the voltage is poor the recorder remains connected until the trouble is corrected.

"When these recorders are used in this manner," says Mr. Sowers,

"We have little or no trouble supplying and keeping the proper voltage for sections. This in turn minimizes electrical trouble on equipment."

The PM program for the preparation plant employs the same setup as the mine. The plant operates two shifts daily. The shifts start at 8:00 am and 8:00 pm. The plant is idle from 3:15 pm to 8:00 pm.

The maintenance shift is from 1:00 pm to 8:15 pm. All routine repairs and inspections are made between shifts and major repairs and difficult inspections are done on Saturday.

The outside shop employs five mechanics; three are on the day shift, one on the evening and the other on the third shift. These men rebuild and overhaul parts and equipment and perform other duties normally associated with shop activities.

Final Results

The effectiveness of the PM program at Delmont Fuel can best be measured by the results of the first 5 mo the program was in operation. The percentage of delays during December, 1956, was 31% compared to 13% for April, 1957—a decrease of 18%. This percentage has continued to drop and at present is below 10%. When results such as these are obtained from a PM program, the program also can be expected to show substantial saving in labor and material and result in greater efficiency from machines—and it has done just that.

Modern Epoxy Insulation Improves Motor Life

By W. Schneider, Manager, Repair Engineering,
Westinghouse Electric Corp.

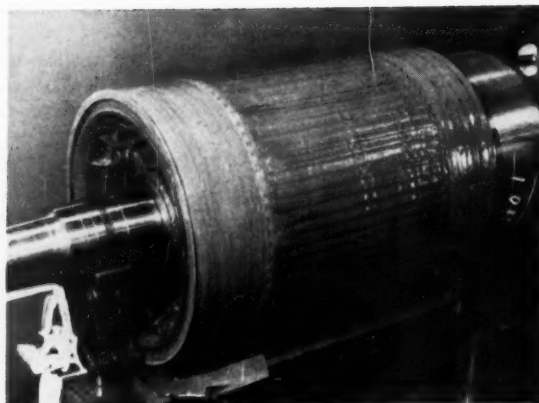
MINE MOTORS are required to operate in environments characterized by high humidity and the presence of oily, chemical, abrasive and other contaminants. Much research has

been directed to alleviating this serious problem by the development of new and improved insulation systems.

The introduction of Coilife in 1953 was an example of an improvement over conventional dipping and baking methods. With this solvent type epoxy resin the windings received:

1. Minimum of two dips and bakes in a solvent-type epoxy varnish.
2. Complete encapsulation of end windings with an epoxy-resin com-

Adapted from an article in Westinghouse Maintenance News.



ARMATURE with epoxy treatment. Smooth glossy surface provides complete winding protection.

VARIOUS SIZE AC STATORS have been completely encapsulated with the new epoxy insulation. Note the winding protection and thin-wall encapsulation in cutaway section of stator at bottom.

pound carefully applied so as to remove any entrapped air.

3. A final one or two coats of an epoxy-based enamel.

This process showed a marked improvement even under severe operating conditions. However, it was recognized that a solvent-type epoxy varnish was employed that required considerable time to remove.

Continued research and development with concentrated engineering and field testing led to improved processing techniques, new material and the use of solventless epoxy resin which gave added protection against atmospheric contaminants. All these were incorporated in a new Super Coilife. The resultant process is an insulation system that offers protection from within a winding element as well as from the outside.

Development

This process was developed primarily for application to integral horsepower, random-wound stators, rotors and armatures. This is the range of motors often used in severe atmospheric locations. Their functions are essential, and failure or shutdown is costly. Proper electrical maintenance is either not always adhered to or difficult to perform at

the location. There are, however, additional reasons for an improved or super insulation system.

Materials — Additional protection from within the winding structure is obtained by the use of better insulated wire and modern winding insulation items. All random-wound or mush-type coils use an improved insulated wire which further reduces the possibility of turn-to-turn failure. Also, only nonhygroscopic materials are used for slot cells, phase insulation, wedges and ties.

The windings are given a two-part epoxy-resin treatment. The epoxy is a specially blended solventless resin with orange pigment added as an identifying feature. Amine-type catalysts are used instead of reactive hardeners. The epoxy is thermosetting and once polymerized will never again liquefy. It possesses a tenacious adhesive ability and excellent wetting characteristics. Both the uncured and cured epoxy are extremely resistant to moisture.

The catalyzed epoxy has a very low viscosity as applied which, with capillary action, encases each individual conductor and permeates all interstices of the end and slot portions of the winding structure assuring an essentially void-free, thoroughly consolidated mass.

The cured epoxy has good compressive and tensile strength and a high factor of flexibility. These are necessary in view of the differential movement between copper, iron and insulation during normal operation cycling, which otherwise could result in surface crazing and cracking.

The epoxy used, when properly applied and cured, results in a smooth glossy void-free surface on which moisture, dirt and dust do not easily collect or cling. Any small accumulation can easily be wiped, blown or flushed away.

Application—Two epoxy materials are used in this process. First, a specially blended catalyzed epoxy resin is applied. This resin permeates the entire winding element including both the end and slot portions. The action of this material and the exclusive application system, plus the fact that no solvents need be removed, results in thin-wall encapsulation which eliminates hot spots and assures maximum heat transfer with dissipation directly from the windings.

After the winding structure has been completely permeated and immediately before polymerization of the permeating epoxy, an encapsulating compound is applied. This compound consists of the same basic

epoxy resin filled with a specific amount of silica to make it thixotropic. The filled resin is applied freely to the end windings until the desired degree of encapsulation has been obtained.

Curing—After the filled encapsulating resin has polymerized the treated winding structure is cured. Post-cure on a 5-hp stator winding, for example, would be from 1 to 2 hr at 155 C. The amount of post-cure determines the density of the molecular structure of the epoxies, which in turn increase electrical properties as well as chemical and water resistance. Also, after the motor has been reinstalled, normal operation will result in further enhancing the virtues of the epoxies.

Technical Data

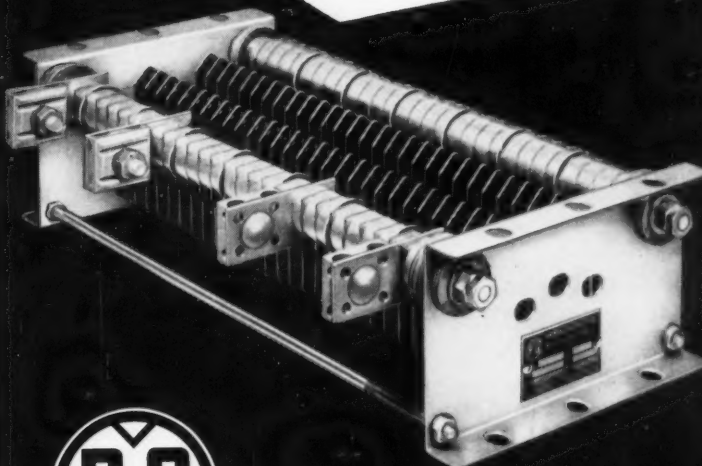
Epoxies used have many important features. While the chemical resistance is a major quality other characteristics also are inherent. A properly treated winding has a relatively short cure cycle with no volatile by-products. The epoxies retain their fine dielectric and adhesive properties for at least the life of the winding.

A properly processed winding displays excellent thermal cycling properties under very severe shock. The wound stator of a 1½-hp motor, for example, was subjected to 10 cycles involving holding overnight at minus 25 C and then plunging into boiling water.

For an additional 10 cycles the processed stator was preheated to 175 C for 4 hr and then placed immediately in a cold compartment at minus 25 C. After testing, the stator was thoroughly examined and found to have no signs of cracking or crazing either on the surface or of the encapsulation in its entirety.

A 1-hp motor processed the same way was submerged in river water. Before submersion the treated stator windings registered 1,800 megohms. After 432 hr, without wiping or drying (except the leads to eliminate dribbles) the winding instantly registered 6 megohms; after 1 min of draining, 10 megohms; and after 1½ hr, 100 megohms. After setting overnight in an open room without external heat the winding recovered to more than 1,400 megohms. This clearly indicated that no water had penetrated the winding insulation.

There is a
difference
in Resistors



Resistors have proved
this for many years

Different, because steel and mica, both extremely durable materials, coupled with P-G exclusive design produce a resistor of great mechanical strength. There is nothing to break. With accurate resistance values and adequate carrying capacities, P-G Resistors outlast ordinary resistors. Tell us your specifications and let P-G solve your resistor problem.

For any job . . . Where constant "trouble free" resistor service is wanted . . . you can safely specify P-G Steel Grid Resistors and get better performance with low cost maintenance.

The Nonbreakable Steel Grid Resistor



THE POST-GLOVER ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

More coal at the hopper ...at lowest cost-per-ton

New 80-ton LW Haulpak[®] completes cycles faster than 50-ton competitive haulers

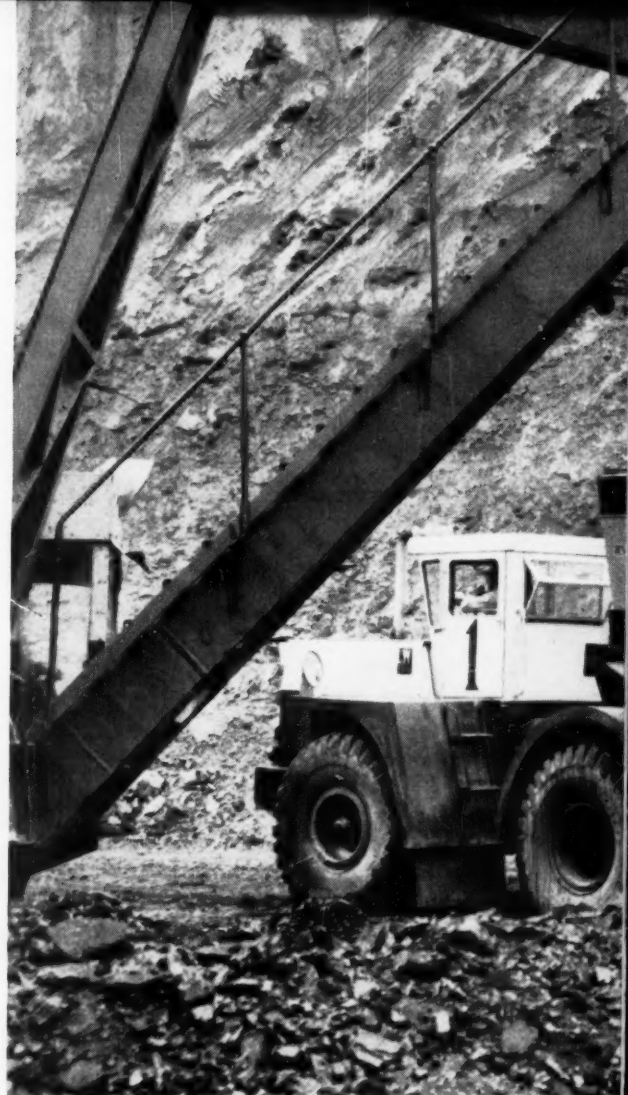
You will find a specification-check of the LW-80 Haulpak coal-hauler quite surprising. Although this new bottom-dump coal-hauler has a capacity of a full 80 tons:

- it is only 5' longer than trucks in the 50-ton range, and it actually makes U-turns in less space.
- it has higher *speeds* than most 50-tonners, exploding the myth that "the bigger the rig the slower."
- and it *weighs* less than many of the smaller units.

These are not mere spec-sheet advantages. They're all on-the-job reasons why LW-80 loads easier, hauls faster, and dumps quicker, than any coal-hauler now on the market. They're part of the *new and different* design concept that lets this 80-ton truck *complete cycles in less time than 50-ton trucks*, with the big bonus of more tons per trip in your favor. Here are some examples of this new and different Haulpak design:

No springs... yet rides smoother

The LW-80 has no springs... and no front axle. Instead, its wheels are mounted on exclusive Hydrair* cylinders, an aircraft-type wheel suspension adapted for the first time to truck use. This system is so effective as a shock-absorber that it will lift a wheel off the ground before permitting metal-to-metal contact! Hydrair also permits greater ground-clearance, much sharper turning, and it rides smoothly over the roughest haul-road. Hydrair *cuts costs*, because it needs almost no maintenance!



More capacity per foot of length

In the LW-80, you carry about 65% more coal *per foot of trailer length* than you do with conventional trucks... specifically, $4\frac{1}{2}$ cu yd per foot with the LW-80, compared to about $2\frac{3}{4}$ cu yd per foot with ordinary trucks. That's because the LW-80 has a much lower bottom frame, and a lower center of gravity, permitting a much "deeper" bowl. This saving in length means greater maneuverability for easy "spotting" under a shovel, and a saving in total machine weight.

More payload per pound of machine

This greater "compactness", together with skilled use of light-weight, high-tensile strength steel and sturdy reinforcements, has reduced overall weight to the point where every pound of *machine weight* in the LW-80 carries *two-and-a-half pounds payload weight*! You get maximum use of horsepower... to move coal, not truck!

More **USABLE** horsepower

The LW-80's low deadweight is only *one* of its power-saving features. This new machine's *fan*, for instance, cools efficiently on only 10 hp, compared to 30 to 40 hp on conventional trucks. Another power-saver: the LW-80's final drive has only 6 gears, compared to the normal 12, and the fewer parts you turn, the more power you have available to pull payload!



Some of the other features engineered into this "super" coal-hauler include: sealed-for-life bearings, with only *three* grease fittings on the entire machine . . . exclusive LW Power-Transfer Differential that keeps this rig rolling through soft or slippery footing. Although LW offers you the economies of mass-production in this straight production-line tool (as compared to the extremely high-priced "hand-made" haulers usually offered in its size range), the LW-80 can be modified easily to your *specific* needs.

Since 1957, the LW-80 has been performance-tested in some of America's largest coal strip-mines. We'd like to show you motion pictures of these machines at work for these owners, who have kept accurate cost records and have ordered additional machines on "proof of performance." Or, even better, let us show you LW-80's *in action*. Talk personally with the men who own them. Just phone your nearby LW Distributor or contact our factory Truck Sales Division direct.

LW-80 is powered by 450-hp Cummins V-12 diesel with Allison transmission and torque converter. It offers 4 forward speeds to 40.1 mph; 2 reverse to 7.8 mph; ten 18.00-33 (32PR) tires; and full power steering. It weighs approx. 74,000 lb empty, 234,000 lb loaded.



Haulpak engineering is also available in these end-dump models, with 22, 27, and 32-ton capacities. These are the first all-new off-road haulers in a quarter century!

*Trademark HP-2263-M-2



LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



MINING, BOLTING, LEGISLATION—Angus McDonald (left), Kentucky Oil & Gas Association; Fred Moran, Kentucky Oil & Gas Association; Edwin McGaw, West Kentucky Coal Co., session co-chairman; B. F. Reed, Turner-Elkhorn Coal Co., institute president; Glenn Lovern, Lexington city manager; E. M. Pace, Inland Steel Co., session co-chairman; J. A. Liddell, The National Lock Washer Co.; and William Stapleton, Clinchfield Coal Co.

Kentucky Mining Institute studies . . .

New Techniques, Costs and Safety

Developing a new mine, roof-bolt tension indicators, industrial engineering and underground augering major themes at KMI's 20th annual meet.

PLANNING and developing Moss No. 3 mine, underground augering and roof-bolt tension indicators highlighted the 20th annual meeting of the Kentucky Mining Institute at Lexington, Ky., Nov. 12 and 13. Other topics discussed included cost control, proposed legislation regulating oil and gas well drilling, mining in South America, and mine fires and explosions. More than 225 members and guests attended the two-day meet.

At the business session, institute members elected H. B. Jones, Eastern Coal Corp., Stone, Ky., to the post of institute president. Other officers elected for the coming year include Edwin McGaw, West Kentucky Coal Co., Madisonville, Ky., first vice president; Noah Mayhew, Blue Diamond Coal Co., Leatherwood, Ky., second vice president; E. B. Taylor, High Splint Coal Co., High Splint, Ky., third vice president; and J. H. Phalan, chief, Kentucky Department of Mines & Minerals, re-elected secretary-treasurer.

Directors elected for the coming year include William Crawford, Princess Elkhorn Coal Corp., David, Ky.; H. O. Zimmerman, Inland Steel Co., Wheelwright, Ky.; B. F. Reed, Turner-Elkhorn Coal Co., Drift, Ky.; W. T. Cahoon, Carrs Fork Coal Co., Allock, Ky.; B. W.

Whitfield, Harlan Collieries Co., Harlan, Ky.; Norman Yarborough, Harlan Fuel Co., Harlan, Ky.; Harold Kirkpatrick, Beech Creek Coal Co., Greenville, Ky.; H. E. Knight, West Kentucky Coal Co., Madisonville, Ky.; J. H. Graham, Jewell Ridge Coal Co., Tilford, Ky.; Harry Laviers, Southeastern Coal Co., Paintsville, Ky.; R. D. Jones, Kentland-Elkhorn Coal Co., Dunlap, Ky.; and R. V. Venable, Feds Creek Coal Co., Biggs, Ky.

R. L. Vines, Kentucky Department of Mines & Minerals, Lexington, Ky., and Elkins Payne, United States Steel Corp., Lynch, Ky. were co-chairmen of the program committee. Co-chairmen of the Thursday technical session were Edwin McGaw, West Kentucky Coal Co., Madisonville, Ky. and E. M. Pace, Inland Steel Co., Wheelwright, Ky. Norman Yarborough, Harlan Fuel Co., Harlan, Ky. and W. T. Cahoon, Carrs Fork Coal Co., Allock, Ky. were co-chairmen of the Friday session. Abstracts of the technical papers are as follows:

Planning and Developing the Moss No. 3 Mine, W. A. Stapleton, division superintendent, Clinchfield Coal Co., Dante, Va.

In addition to describing the develop-

ment of Moss No. 3, Mr. Stapleton added up-to-date details of the pillar recovery methods, application of millisecond delays in blasting and auxiliary face ventilation. A full description of the Moss No. 3 mine and preparation facilities appeared in *Coal Age*, July, 1959.

Production for 1959 originally was projected at 3,000,000 tons. Up to now we have produced over 2,800,000 and expect to mine over 3,250,000 tons in our first full year of operation.

Production on our pillar sections has not been very satisfactory. The biggest delay in pillars has been timbering. To speed up our timbering we are now developing a machine that will expedite handling and setting 12- to 16-ft timbers.

Our original projections called for 60-ft centers on main entries and 80-ft centers in panels. A few months ago we changed our panels to 60-ft centers to cut down on tramming distances and to provide shorter lifts on pillars. We found that the smaller pillars are too weak for the structure of our coal and the thickness of cover. The result has been an excessive number of rib rolls and in some cases we have been squeezed out of a panel section.

We now believe that we have opened too wide a span in our 6- to 9-heading systems, thus allowing the top to bend and throw excessive weight behind the working places. To correct this we have changed our projections in all development to five headings on 80-ft centers



COSTS, AUGERING, SAFETY—W. T. Cahoon (left), Carrs Fork Coal Co., session co-chairman; J. H. Phalan, chief, Kentucky Department of Mines & Minerals; Norman Yarborough, Harlan Fuel Co., session co-chairman; Ray Light, National Mine Service Co.; E. L. Peterson, Paul Weir Co.; and T. N. Shattuck, Wind Rock Coal & Coke Co.

with breakthroughs also on 80-ft centers. We are leaving 160-ft barrier pillars on the panel entries.

In addition we have added a fourth row of bolts to each cut, thus giving us a row of bolts along each rib to eliminate flexing of the top in the entries. Results thus far have been good. Ribs are holding better and production is increasing.

We are now using millisecond delay caps entirely. Our cutting consists of a single vertical shear in the center of each cut. We are drilling four rows of holes and from 14 to 22 holes per cut. Our cutting and shooting is giving very good results.

Two of our portals are now gaseous. On some sections we are using auxiliary ventilation, with collapsible tubing carrying air to within 25 ft of the face. Air is provided by a blower fan installed in intake air. It discharges into a 30-in duct with branch lines running into each working place. We are able to provide from 2,000 to 3,000 cfm of fresh, uncontaminated air to each working face. Results so far have been good and the system has made it possible for us to get full production in our most gaseous sections.

At two of our portals we are operating three shifts. To maintain our equipment we have set up a preventive maintenance program. We have a "float-out" section which works with a different crew each day. A permanent foreman stays on this section on each shift and works the production crew from the other sections that are idle for preventive maintenance. The foreman on the idled section stays with his equipment and sees that the necessary maintenance work is done.

Roof Bolt Tension-Indicating Washers

J. A. Liddell, The National Lock Washer Co., Newark, N. J.

A more accurate method to indicate bolt load has always been needed and the roof bolt tension-indicator washer fills this need. We are ready to offer this visual signal at less than 7c per bolt.

The tension-indicator washer is in appearance a helical spring washer; however, it is fabricated from a special steel to rigid industry specifications. It has been time tested to specifications drawn up by the AREA in 1933 and is still functioning satisfactorily in the railroad industry.

The indicating washer is often erroneously referred to as a lock washer. This is a misnomer as the washer does not lock but does maintain bolt tightness because of its helical construction. It requires about 6,500 lb load, plus or minus 5%, to close the washer visually. The roof bolter needs only to know that he must close the washer. If the bolt should loosen the washer would reopen, thus providing a visual indication of the loosening. Even though the bolt load decreases the washer maintains force between the bolt head and plate and preserves some of the tension in the bolt.

Several test installations already have been made but we need more to prove the value of our product. The major bolt manufacturers have agreed to test installations in the immediate future and several coal mines have authorized test installations.

At Mather Collieries 400 washers were installed and a check was made three weeks after the installation. A visual check of 70 bolts showed that 20 had partially opened. These bolts tested 20

INDUSTRY MEETING— A Special COAL AGE Staff-Written Report

to 100 ft lb of torque remaining. Torque on bolts whose washers appeared to be closed range from 103 to 170 ft lb.

Proposed Legislation Regulating Oil and Gas Well Drilling, Fred Moran and Angus McDonald, Kentucky Oil & Gas Association.

The proposed Kentucky oil and gas conservation act is designed to foster conservation of all natural resources, to encourage exploration for such resources, to protect correlative rights of land and mineral owners, to prohibit waste and unnecessary surface loss and damage, and to encourage the maximum recovery of oil and gas.

The proposed bill is not designed to eliminate the oil or gas company's responsibility in drilling through coal seams. But it is an attempt to bring the oil and gas industry in line. Among the chief aims of the law are regulations regarding hole spacing and drilling permits plus revisions in plugging regulations.

An Industrial Engineer Looks at Cost Control, Earl L. Peterson, Paul Weir Co., Chicago, Ill.

Cost reduction cannot be a hit or miss proposition. Everyone in the organization should know what must be done and when it must be done. Having spelled out the job and detailed the means by which the objectives are to be realized is only the beginning. To get the job done requires an organized team applying its combined skill and effort.

Cost reduction programs often associate only various technical means by which the results are obtained. But can there be any really successful cost reduction unless there is organization, effective leadership and sound human relations? If worker productivity is to improve, the essential leadership must come from management.

Quite often, new or better equipment is assumed to be the only means to further cost reduction. Sometimes this is the case. However, unless existing equipment is already being used to near its full potential, there is little assurance that new equipment will be permitted to provide the potential claimed for it.

Employee productivity and equipment productivity, the two prime factors that determine most operating costs, will to a great extent vary as the efficiency and effectiveness of maintenance varies. Yet no other operation so essential to good performance and costs is permitted to function as blindly or is ignored more often. Good maintenance costs less than poor maintenance.

The industrial engineer with his train-

ing and applied means for obtaining helpful operational data is often the most logical person to help the foremen develop the necessary supervisory skills to cut costs. Yet if he is to be effective in this relationship, the industrial engineer must have an opportunity to win the confidence of first-line supervisors, to work with them and share their problems.

Underground Augering Under Difficult Seam Conditions, Tom N. Shattuck, Wind Rock Coal & Coke Co., Oliver Springs, Tenn.

To recover coal that could not be mined profitably by conventional means, Wind Rock Coal & Coke Co. now is pioneering an underground auger. The auger, designed to meet Wind Rock conditions by Salem Tool Co., is a hydraulically powered machine made up of a power unit and an augering unit. Each unit is self moving and is leveled and moved with hydraulic jacks. The two units are connected with 50-ft sections of hydraulic hoses.

Preparation for augering includes driving three headings with conventional equipment and then augering off one side advancing and off the other side on retreat. Holes are drilled 100 ft deep and 1 ft of coal is left between holes.

Auger coal falls onto a short chain conveyor mounted on the auger frame. This conveyor discharges onto a modified

Piggyback which transfers the coal to a shuttle car serving as a surge bin. A second shuttle car carries the coal to mine cars.

Three men perform all augering duties, including moving and resetting. The company's goal is to complete four or five 100-ft-deep holes per shift and produce 100 to 135 tons of coal.

A full description of the Wind Rock auger operation appears in the November, 1959, issue of *Coal Age*.

Mining in South America, Ray Light, National Mine Service, Pittsburgh, Pa.

If we are to continue to lead in world politics we will need the mineral resources of South America. As South America develops it will also provide markets for our products, including coal.

Colombia, Peru, Bolivia and Chile possess valuable deposits of iron, lead, zinc, copper, tin and uranium which are important to our economy. Many of these countries need technical assistance and we are not supplying as much help as we should. In many instances engineers and technicians from other countries are filling the gap. One way we can promote good will and improve our relations with South American countries is by giving them advice.

To emphasize the difficult problems facing the mining industry in South America, Mr. Light showed a series of

slides of various South American mining areas. He stressed the rugged natural conditions, remoteness and high altitude that make mine development difficult.

Mine Fires and Explosions, James H. Phalan, chief, Department of Mines & Minerals, Lexington, Ky.

Since our last meeting there have been reported five fires and one explosion. Three of these fires were underground and two on the surface. The explosion which took two lives was connected directly with a preparation plant 2 mi from the underground operations.

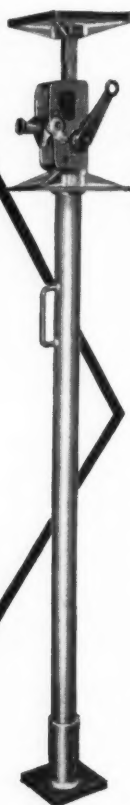
The explosion occurred beneath the raw-coal storage pile in a tunnel through which coal is fed by belt conveyor to the preparation plant. Both men were plant maintenance men and had entered the tunnel to repair the feeder. Methane liberated from the raw coal in the hopper in all probability was ignited by the filament of an electric bulb accidentally broken while the men worked on the feeder.

The presence of coal dust appeared to have contributed in a minor way to the violence of the explosion. Repeated tests showed that after being crushed and transported 2¼ mi from the mine by belt and dumped into the stockpile the coal still liberated an amazing quantity of methane. Adequate ventilation of such installations will eliminate such hazards.

NEW easy way to recover roof bolts with **SIMPLEX**

TRIP POST JACK No. M279

- 24" Rack Bar Travel
- High Strength Aluminum Alloy Column and Castings
- Light weight — 72" min. height, weighs only 36 lbs.
- Sizes for all seam heights available

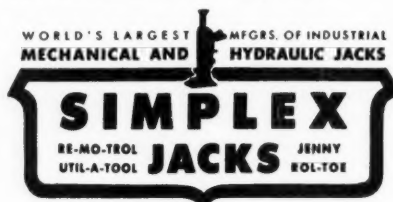


SAFE, EASY-TO-USE...

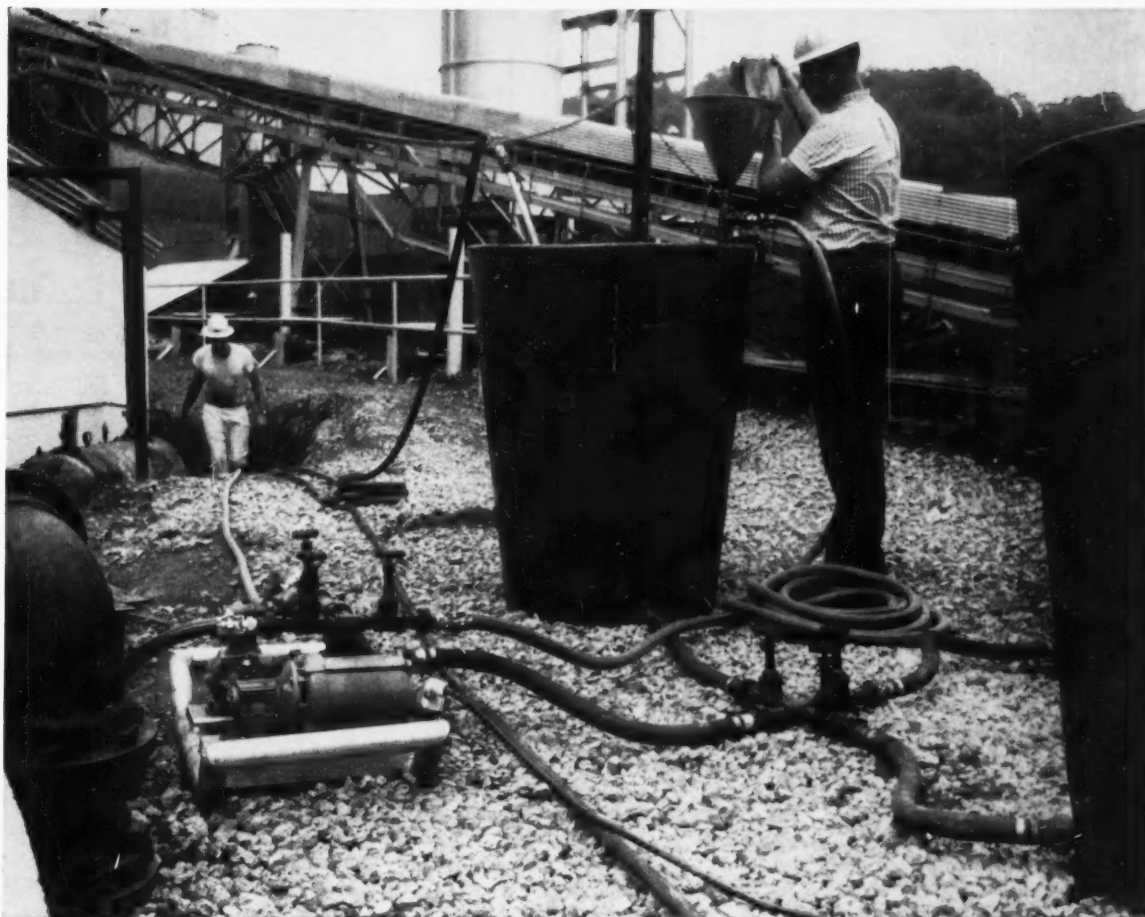
Two men can recover
350 bolts per day by
using it as follows . . .

Place a Jack alongside each of the first row of bolts closest to the face. Raise to the roof to provide temporary support. Remove bolts by hand or pneumatic wrench. Stand 25' or more away and pull on a rope attached to the Jack trip lever which collapses the Jack. Move Jack to position under the next row of bolts and proceed as previously.

SEE YOUR DISTRIBUTOR, or write
TEMPLETON, KENLY & CO.
2501 Gardner Road, Broadview, Illinois



SEPARAN AP30



This Equipment Takes the Risk Out of Trying Separan AP30 For Flocculating Coal Fines

Using this test equipment, engineers of the Dowell Division of The Dow Chemical Company can demonstrate how Separan AP30® can help coal producers reduce the cost of coal-washing operations.

Separan AP30 was developed by Dow for the flocculation of coal and slimes. An anionic polymer, it offers many advantages over earlier materials.

However, since it is completely different from earlier agents, different application techniques are required. Many operators have been reluctant to go to the expense of setting up experimental mixing and proportioning systems.

Now there is no more risk of excessive experimental costs. Dowell can move in equipment like this, mix Separan AP30, and proportion it into the washing

system. Quickly, Dowell engineers can tell how much Separan AP30 is required and how it can be fed to best advantage.

The operator can tell — in advance — how much he can save by using Separan AP30. He can also experimentally determine the feed points that will give optimum results.

At this stage, risk of loss is negligible. He can then install a simple feed system with confidence of success.

Separan AP30 is available from Dowell stations in the major coal-producing areas of the United States. For more information or consultation, contact the Dowell District office at 1918 Highway 41 North, Evansville 7, Indiana. The telephone number is HArrison 5-1353. Upon request, a Dowell Engineer will call promptly, without cost or obligation.

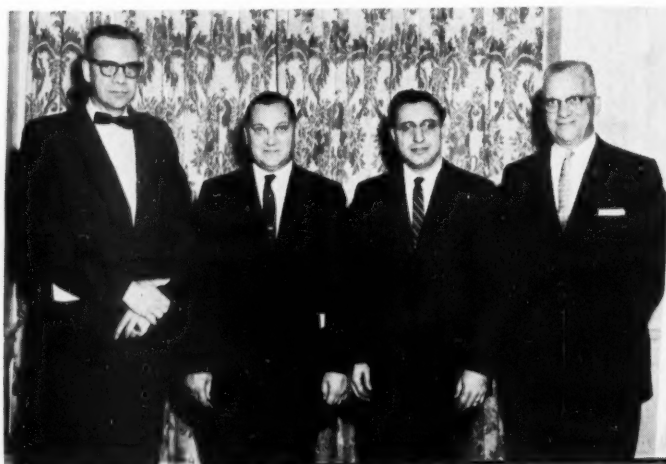
Services to the coal industry

DIVISION OF THE DOW CHEMICAL COMPANY

DOWELL



COAL'S FUTURE—J. E. Moody (left), president, National Coal Policy Conference, and J. D. Reilly, Hanna Coal Co., CMIA president.



VENTILATION—D. S. Kingery (left), Bureau of Mines; George Stachura, Bell & Zoller Coal Co.; John J. Adams, Mountaineer Coal Co., and W. E. Hess, Jones & Laughlin Steel, and president-elect, CMIA.

73rd Annual Meeting, Coal Mining Institute of America

Coal's Entry Into the 1960's

Challenges to competitive fuels and support for a full study of U. S. fuel resources and distribution are needed now.

Technological advances in production bring forth new ideas in ventilation, power and other services.

AN EXPLANATION of the objectives of the National Coal Policy Conference in seeking to bring about an overall study of the nation's fuel resources and needs for security and growth was one of the

highlights of the 73rd annual meeting of the Coal Mining Institute of America, the oldest mining institute in the U.S., at Pittsburgh, Pa., Dec. 3-4. The emphasis in the technical sessions was on the

recent improvements that have been made in service functions to continue the industry's gains in production efficiency.

At the business session it was reported that the institute has grown to a total membership of 875, a gain of 100 members over last year. A report by J. W. Hunt, Mineral Industries Extension Div., Penn State, for CMIA's training and education committee, told of dwindling enrollment in mining engineering courses at Lehigh University, West Virginia University, Pitt and Penn State. Normal attrition among students in a 4-yr mining-



SERVICES—D. H. Davis (left), Mathies Coal Co.; G. W. McCaa and Ralph W. Hatch, Hanna Coal Co., and Nicholas M. Spanos, Frick Dist., U. S. Steel Corp.



SESSION CHAIRMAN—J. F. Core, U. S. Steel, and institute vice president.

engineering program indicates that 4 yr hence only 13 graduates will be available to the industry from these four schools. This brings up the question of whether the universities can continue to maintain mining-engineering departments. Intensive and continuous publicity, particularly among young men, must be pursued, Prof. Hunt declared.

Also at the business session Clinton Hoch, staff representative, National Safety Council, Chicago, Ill., explained the goals and operation of the 1960 campaign to reduce the frequency of injuries from roof falls. The goal of the industry-wide effort is to reduce this frequency rate by 50% in the coming year.

James D. Reilly, vice president, Hanna Coal Co., Cadiz, Ohio, in his address as retiring president of the institute, advocated a reaching-out by CMIA to include technical speakers and membership from other mining regions, inasmuch as the institute has the facilities and program to attract men from other areas.

Of major importance is the problem of attracting young men to the industry, Mr. Reilly said in pointing out that another important factor is determining whether these young men really have a desire to build careers in mining. Offering summer employment to these young men early in their careers should help them to make up their minds in a minimum of time. Their employment need not be costly if the hiring company makes plans for their employment in functions where they can pay their way through service. However, even if the program does cost something in its early stages, the payoff will come when one good man catches hold, and stays and develops professionally, Mr. Reilly stated.

Mr. Reilly is succeeded in the presidency of CMIA by W. E. Hess, manager of mines, Jones & Laughlin Steel Corp., California, Pa. The full slate of officers elected for 1960 is presented in an accompanying panel.

Keynote speaker of the 2-day meeting was Joseph E. Moody, president, National Coal Policy Conference, Washington, D.C., on the subject, "America Takes a New Look at Coal," an analysis of the goals of the conference, the present fuels picture and the reasons for coal's support of a national fuels policy.

Perhaps the most important immediate objective of the National Coal Policy Conference is the support of a Congressional resolution which calls for a national fuel policy study, Mr. Moody explained. The resolution, which was introduced in the closing days of the 86th Congress, would provide for a 16-member committee, eight from each chamber, to (1) conduct a study of present and future fuel needs and resources and (2) recommend to the Congress proposals for an overall fuels policy to meet national

CMIA Officers for 1960

President—W. E. Hess, Jones & Laughlin Steel Corp., California, Pa.

First Vice President—W. D. Walker Jr., U.S. Bureau of Mines, Pittsburgh, Pa.

Second Vice President—J. F. Core, U.S. Steel Corp., Pittsburgh, Pa.

Third Vice President—R. H. Jamison Jr., Delmont Fuel Co., Hunkers, Pa.

Secretary-Treasurer—J. M. Lowe, Emerald Coal & Coke Co., Pittsburgh, Pa.

Managing Directors—2-Yr Terms

H. R. Johnson, Mine Safety Appliances Co., Pittsburgh, Pa.

J. S. Whittaker, Pittsburgh Coal Co., Div. of Consolidation Coal Co., Library, Pa.

R. C. Beerbower Jr., U.S. Steel Corp., Uniontown, Pa.

J. D. Reilly, Hanna Coal Co., Div. of Consolidation Coal Co., Cadiz, Ohio.

J. A. Brookes, Mather Collieries, Pickands Mather & Co., Mather, Pa.

Managing Directors—1-Yr Terms

D. H. Davis, Mathies Coal Co., Library, Pa.

J. E. Elkin, Duquesne Light Co., Pittsburgh, Pa.

G. W. McCaa, Hanna Coal Co., Div. of Consolidation Coal Co., Moundsville, W. Va.

W. G. Stevenson, Emerald Coal & Coke Co., Pittsburgh, Pa.

C. B. Tillson Jr., Crucible Steel Co. of America, Pittsburgh, Pa.

energy demands for long-range peaceful expansion and immediate national security. The issues will be revived when Congress reconvenes this month. The coal industry wants the study, the gas and oil industries oppose it, Mr. Moody said in explaining that the coal industry feels that oil and gas are dumping at coal's expense.

The bone of contention with the oil industry is the importation of residual oil from Venezuela, and with the gas industry the sales of natural gas to industry and utilities. In these instances, the dumping at low prices is done in areas where coal can be competitive and the cheap rates are made up in other areas, where coal is not competitive, and among domestic consumers.

The experts say that coal's future is assured, that its potential is great. We want to begin realizing that potential, Mr. Moody declared, not in 10 or 15 yr, but now at the outset of what is predicted will be the most dynamic decade in our Nation's history. The National

Coal Policy Conference hopes to spearhead this resurgence.

Abstracts of papers presented at CMIA's three technical sessions are as follows:

Face Ventilation and Dust Control With Borer-Type Continuous Miners, by John J. Adams, industrial engineer, Mountaineer Coal Co., Fairmont, W. Va.

Experiments at Mountaineer Coal Co., designed to improve face ventilation in continuous-mining places, led through a number of applications of auxiliary fans. Included were a blower-exhauster combination, two exhaust fans with a blower on the miner and a water-injected dust collector. The object was to achieve higher efficiency in getting air to the face than could be obtained with line curtains. A fuller review of Mr. Adams' paper appears in *Coal Age*, December, 1959, p 139.

In the discussion following Mr. Adams' presentation a question was raised as to how methane emission is handled as a miner retreats from a working place, inasmuch as roof and rib emission behind the miner is a problem in advancing work. Mr. Adams explained that a brattice line is hung in the center of the place and up over the miner to the face. The machine then is brought back and tubing is removed as needed during the retreat. The line curtain is left in place to create a current of air that will continue to remove methane until the place becomes active again. This procedure is followed on weekends and holidays at the 3-shift mine.

On the question of handling dust at the discharges of the exhaust fans, Mr. Adams explained that a number of bags of rock dust are stored near the fans and this is distributed in the discharge stream from the fans by assigned men. In fact, the entire application of auxiliary fans is closely supervised, and section power is not applied to operate equipment until after a gas examination has been made by a certified official and accumulations of methane, if any, have been removed.

Fundamental Principles in Face Ventilation With Auxiliary Fans, by D. S. Kingery, acting research director, Health and Safety Research and Testing Center, U. S. Bureau of Mines, Pittsburgh, Pa.

The combination of an exhaust fan with tubing and a blower or diffuser on the machine provides the advantages of adequate air at the face and better visibility through better dust removal. However, both fans must be operating to make this system truly effective.

Fan and tubing both are important in developing high efficiency in face ventilation. Fan size will have to be determined from a study of the duty to be performed. The corrugated tubing com-

INDUSTRY MEETING— A Special COAL AGE Staff-Written Report



FOAM-PLUG FIREFIGHTING—John Nagy (left), U. S. Bureau of Mines, Pittsburgh, and Will B. Jamison, Foamex, Inc., Greensburg, Pa.

SAFETY RECORDS—M. W. Thomas, Pennsylvania mine inspector, Windber.

monly used has a much higher resistance factor than the ducts used to establish most manufacturers' listed fan capacities. Moreover, the effective diameter of corrugated tubing is 1 to 2 in less than the rated diameter. The largest practicable tubing should be used. Note that 14-in tubing will deliver only about half the air delivered by 18-in tubing at the same pressure differential.

It is recommended that auxiliary fans be operated continuously during face operations. When a fan is stopped between shifts or during an extended power failure a line brattice should be erected. Tubing should be installed to prevent excessive leakage and should be extended from roof or rib clear of traffic.

Ventilation Problems With Conventional Mining, by George Stachura, assistant vice president, Bell & Zoller Coal Co., Johnston City, Ill.

Bell & Zoller operates six mines, four in Illinois and two in western Kentucky, all except one in Illinois operating with exhaust systems of ventilation. None of these can be considered very gassy since little methane is encountered when air is kept up to the working faces. Where pillars are properly pulled and caves are made systematically there is little trouble, but if coal is not properly taken, problems with methane ensue from resulting squeezes.

In summary, the job of good ventilation requires:

1. Efficient fans to create the desired pressure differentials;
2. Lowest possible resistance to air flow through the use of adequate airway area and clean airways;
3. Reduction of losses by preventing leakage at stoppings and other air-control devices;
4. Well-planned splitting procedures to increase safety and effectiveness of control;

5. Designing bleeder systems to insure effective ventilation of worked-out areas.

Experience With AC Power at Ireland Mine, by G. W. McCaa, general manager, Hanna Coal Co., Moundsville, W. Va.

Three years' experience with AC power at Ireland proves that this system was the correct choice from the standpoints of economy and safety. Primary distribution is at 7,200 V for the following reasons:

1. Mine projections required that power be distributed for a distance of 5 mi from the main substation, and highly concentrated loads in continuous-mining sections ruled out the use of 4,160 or 2,300;

2. Surface topography is rough, making it difficult to maintain surface transmission lines;

3. Thick cover would require boreholes over 1,000 ft deep if surface transmission facilities were used.

Power is received at 69,000 V and reduced to 7,200 V at a surface substation which contains all safety and control equipment, including a stainless-steel grounding resistor. An underground fault in the system deenergizes the mine and indicators show the source of the trouble. A continuous ground-continuity system is maintained throughout the mine, making it impossible to energize the mine power circuits if the ground circuit is separated for any reason. Cable for underground transmission includes 4/0 conductors with No. 4 ground wires, one of which is insulated to provide the ground-continuity circuit operating at 24 V.

Concerning the advantages of AC equipment, there have been a minimum of motor failures, usually resulting from mechanical troubles, and savings in using transformers instead of the converters that would be necessary with DC face power amount to about \$7,000 per yr.

Core Drilling, by Nicholas M. Spanos, mining engineer—special projects, Frick Dist., U.S. Steel Corp., Uniontown, Pa.

Large-scale core drilling in the Frick District was begun in 1933 to explore nearly 70,000 acres of virgin coal in Greene County, Pa., in the area later to be developed into Robena mine. Primary purpose of the drilling program was to obtain cores of the Pittsburgh seam to accurately determine the quality of the coal, thickness of the seam and depth of cover. With this information mining operations could be planned to insure long-term uniformity of product.

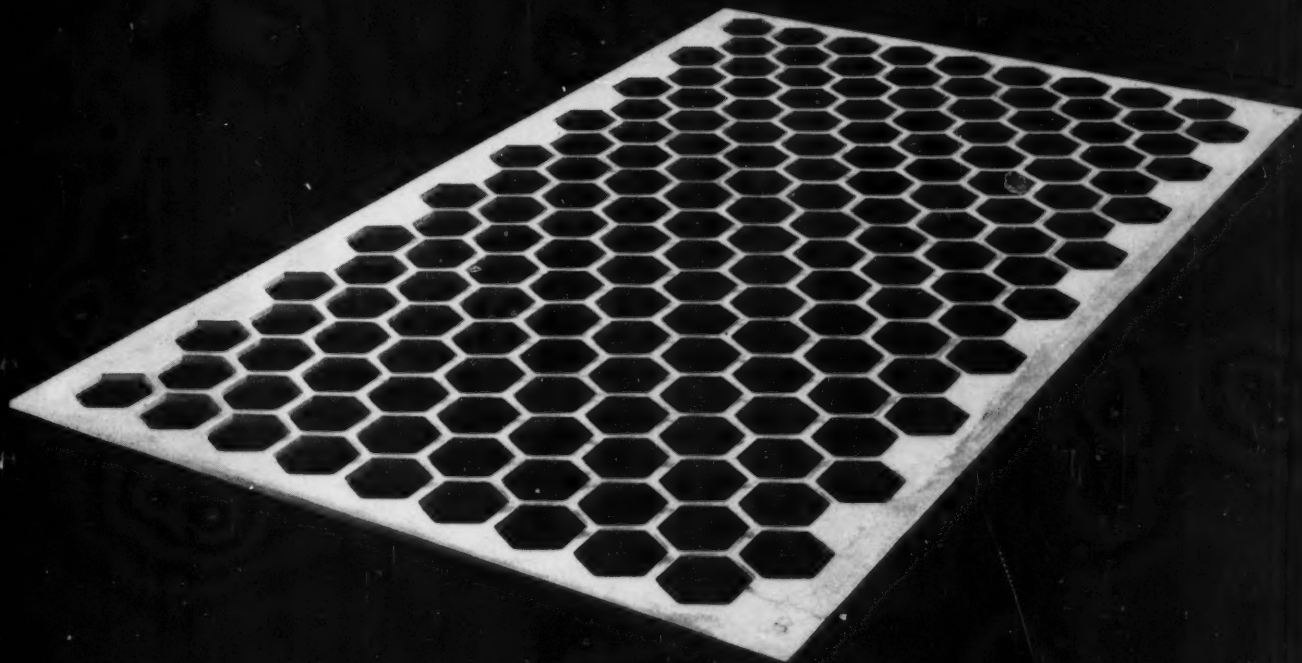
In early drilling it was found that five want areas occurred within the Robena field. As a result, new drilling programs were begun to determine the limits of the want areas. The work usually was let on contract after the company had secured drilling rights.

In setting up the program a 2,500-ft grid system was established, with actual spacing of holes varying from 1,800 ft to 2,700 ft to conform to property lines or save on drilling rights. Cores are 2 1/4 in in diameter.

All cores were logged and the core of the coal seam was separated and crated and sent to the laboratory for analysis. The remainder of the core was used to refill the drillhole after the bottom section of the hole had been grouted. At the laboratory different benches of the seam core were analyzed separately and washability curves were prepared. A total of 592 holes have been drilled, representing a total drilling length of approximately 66 mi.

In planning a drilling program, the cost of surface rights, engineering and supervision, analysis and drilling may be estimated by dividing the contractor's bid by 0.87 to give a total estimated cost.

Other valuable information obtainable from the cores are (1) location and extent of iso-sulfur areas, (2) general dip



For coal screening ...

Cross HEXCREEN* gives more uniform sizing, greater capacity

If you have been using woven wire screens or perforated metal screens with square or round openings, you will find that you can increase capacity, get more accurate sizing with CROSS HEXCREEN. The unique configuration of CROSS HEXCREEN (hexagonal shaped perforations), gives you more open area and less weight than equivalent square or round hole screens, yet provides the sizing accuracy of round type (see example at right).

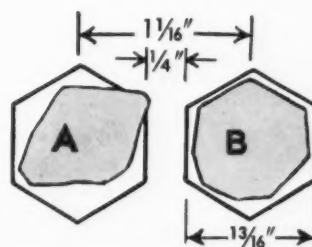
CROSS HEXCREEN is specially designed for sizing granular products such as coal, coke, sand, gravel, crushed stone, slag, limestone, minerals and ores. CROSS perforated steel screens, made from long wearing CROSS Special Analysis Steel, are available in a wide range of sizes with uniformly spaced square, hexagon or round perforations, staggered for increased capacity and efficiency. For additional information on CROSS Perforated Screens write for complete catalog.

* T.M.



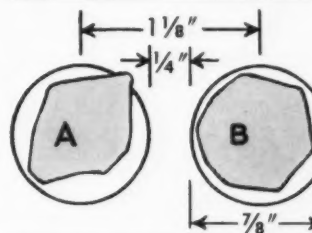
Cross Perforated Metals

NATIONAL-STANDARD COMPANY
Carbondale, Pa.

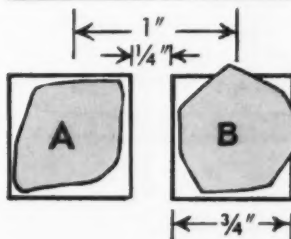


EQUIVALENT OPENINGS

13/16" Hexscreen Rejects A, Passes B, has 58.5% open area.



7/8" Round Rejects A, Passes B, has 54.8% open area.



3/4" Square Passes A, Rejects B, has 56.3% open area.

of seam and (3) contours of all strata above the coal.

Mine Drainage Control in Pennsylvania, by L. S. Morgan, chief, Mine Drainage Section, Pennsylvania Dept. of Health, Greensburg, Pa.

Any coal operator must have a permit from the Sanitary Water Board of Pennsylvania to change the drainage plans at any mine or in opening a new mine. The board cannot regulate drainage from any mine, but it is charged with the responsibility of preventing discharge of acid drainage into clean streams. Hundreds of inspections are made every month by the board to determine the effectiveness of anti-stream-pollution methods and to insure compliance with state requirements.

Good engineering and planning are required to prevent acid drainage. A better understanding of the problem can be developed through continued research, and ultimate solutions will require cooperation among operators, scientists and public.

Mechanization in the Office, by Ralph W. Hatch, statistician, Hanna Coal Co., Cadiz, Ohio.

With modern methods of measuring and testing a huge quantity of information accumulates that must be processed accurately and quickly. Similar equip-

ment can be used to mechanize paperwork. In 1949 Hanna Coal Co. embarked upon such a program of mechanization, beginning with the preparation of the payroll. This process includes all operations starting from the time books marked by the foremen. The savings in 1949 alone amounted to \$60,000.

Later the system was extended to warehouse accounting. When the program began stocks worth \$2,700,000 were already on hand and unfilled orders amounted to another \$1,250,000 worth of parts and supplies. Within 3 yr this total commitment of \$4,000,000 has been reduced to \$2,000,000. Right now, much of Hanna's billing, shipping instructions and notices, daily tonnage reports and other repetitive forms are prepared on the machines. The work is done by three people and \$650 per month for machine rental.

High-Expansion Foam: Use and Method of Application for Bringing Mine Fires Under Control, by John Nagy, chief, E. M. Murphy, chemical engineer, and Donald W. Mitchell, chief, mine experiments section, Branch of Dust Explosions, U. S. Bureau of Mines, Pittsburgh, Pa.

Equipment and procedures used in the foam-plug method of controlling fires must be adapted to local conditions. Some factors to be considered in

developing the equipment are the size of the mine, dimensions and number of entries, the system of ventilation, haulage facilities, amount of methane liberated from the coal and existing fire-control apparatus. The high rate of advance in present mining methods favors the use of a portable, self-contained foam-generating unit that can be operated more or less automatically. Connection of the unit to a water pipeline would require that only the foam-producing detergent be transported to point of use.

The foam plug necessarily alters normal ventilation patterns, and the use of a fan with the generator may reverse or stop flow of air. Foam cannot be used in dead-ends, but it may be used in gob areas if air can be coursed through the area. It should not be used in entries where energized trolley or other wiring is exposed.

The most satisfactory results were obtained with commercial ammonium lauryl sulfate detergent. If the extent of the fire is not known foam should be applied for about ½ hr to 1 hr. It may then be possible to advance the equipment, using a water spray to clear away foam for the move ahead.

In formal discussion, Will B. Jamison, mining engineer, Foamex, Inc., Greensburg, Pa., presented a series of slides illustrating the development of a portable foam-plug generator.

Pennsylvania Bituminous Accident Record, First Six Months, 1959, by M. W. Thomas, mine inspector, Pennsylvania Dept. of Mines & Mineral Industries, Windber, Pa.

The record shows 21 fatalities, 10 from roof falls, in the first half of 1959 in Pennsylvania bituminous mines. The rate is 0.69 fatalities per million man-hr, and a frequency rate based upon all accidents of 20.45. Deep-mine production per roof-fall fatality was 2,724,413 tons.

All fatal accidents occurred in 20 mines of the 2,000 mines working in the Pennsylvania bituminous fields. Production from these mines was 14,850,888 tons, or 707,185 tons per fatality. Production from operations at which no fatalities occurred amounted to 22,230,958 tons. Average age of the men killed was 47 yr, average experience was 24½ yr.

The record is a continuing challenge to all forces interested in the promotion of mine safety.

During the first 6 mo of 1959, 47.62% of all fatalities occurring at bituminous coal mines of Pennsylvania resulted from falls of roof, face or rib. A major effort must be made to prevent this type accident if total fatalities are to be appreciably reduced.

One possibility is active participation by all mines in the 1960 campaign to prevent roof falls.



FLOOD CITY CENTRIFUGAL PUMPS

**DEPENDABLE to the
LAST DROP!**

Where there's unwanted water there's need for a Flood City Centrifugal Pump. Built of either acid-resisting bronze or stainless steel these pumps have a thirsty reputation . . . if there's a drop of water in the vicinity they'll have it quickly.

Sturdily designed and constructed to efficiently work a 24 hour schedule day in day out, Flood City Centrifugal Pumps perform smoothly with minimum attention.



Available in all sizes up to and including
6" discharge and up to 1000 GPM.
Your inquiries welcomed.

Flood City JOHNSTOWN, PA.
BRASS & ELECTRIC COMPANY



All Du Pont permissibles now contain something extra...an extra margin of safety for everyone in the mine.

Ten percent sodium chloride has been added which, according to our interpretation of the U. S. Bureau of Mines data, gives a reduction of at least 50% in the tendency to ignite coal gas. A year and a half of actual underground use has shown that ten percent salt has no effect on the strength, sensitivity, or other explosive properties of the Du Pont Permissibles. But it *does* have a remarkable cooling effect on the flame.

While no permissible used as recommended by the Bureau of Mines has ever been known to cause a coal mine disaster, human error has.

What Du Pont has done is to add an extra margin of safety to compensate for those errors which must always be considered as long as men work the mines.

Today, the lives of all those who mine coal beneath the earth's surface are safer and better through

continuing research.

For complete information on how Du Pont's High-Salt Permissibles can increase the safety of your men, call your Du Pont representative or write directly to Du Pont, Explosives Department, 6444 Nemours Bldg., Wilmington 98, Delaware.



REG. U. S. PAT. OFF.

EXPLOSIVES

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

Foremen's Forum



EFFECTIVE PLANNING and thorough follow-through will become more and more important as a supervisory function in the decade now opening.

Mine Supervision in the '60's

What the coming decade will demand of the coal industry.
How these demands will affect coal's production supervisors.

THE ECONOMICS of competition among the fossil fuels will govern coal's actions in the 1960's to a greater extent than ever before, we think. In adopting the attitude that the best defense is a good offense our industry will make things happen. The establishment of the National Coal Policy Conference and the increasing vigor of BCI's attack on coal-merchandising problems are indicators of this attitude.

In the coming near years coal's merchandising habits will be revolutionized to the extent that the industry's operating habits have been revolutionized in the past 10 yr. These events will have their impact on production operations and we can expect more of the continuous change in mining techniques to which we have become accustomed.

If the required changes in methods are to be realized, we shall need a multitude of new ideas, many of which must come from supervisors. There are a number of examples of what we mean in this issue of *Coal Age*. The article on multiple shooting with Airdox at Green Diamond mine is a case in point. Also, in the report of the meeting of the Coal

Mining Institute of America are references to the use of auxiliary ventilation with continuous miners. There is an article on the development of an electronic monitor for grounding circuits. You will find a number of other ideas as you go through the issue.

These are the kind of developments we shall have to bring to full realization in the near future. Specific examples are new systems for remote control of mining machines, improved roof-control techniques, strip-mine designs and equipment for higher productivity and automatic methane detection.

Not any of these ideas spring into being as full-blown, finished processes. They are developed through experimentation, first in the laboratory and then in the field, and they are refined through effective supervision of their use in the production cycle. The article on multiple shooting with Airdox provides an example of this. Please note that a diligent unit foreman gets a large share of the credit for making the system work. Note also that the success of the system was vital to the company.

Five years ago *Coal Age* published

an article describing the application of an auxiliary fan to improve face ventilation with continuous miners at Warwick mines of the Duquesne Light Co., at Greensboro, Pa. This trial, conducted under stringent control, was the first such application of a booster fan since they got their bad name long ago. In the 5 yr since that breakthrough, auxiliary-ventilation setups have been under constant test at a number of mines. Now we are coming to the point in the industry where definite answers on this subject are emerging. Practicable systems are in use. The experimentation paid off by permitting fuller realization of the production potential of continuous miners.

Methods Change

The experiments and their practical results usually lead to changes in methods. Today's mines look different and the tasks of the workmen are different than they were 10 yr ago. Ten years hence we may see a difference of the same magnitude in the mines of that day compared with now. In both cases



Bethlehem Rope Helps Them Scoop Up Taconite. Here you see an 8-yd shovel at Erie Mining Company, Hoyt Lakes, Minnesota, taking big bites into nature's stockpile of taconite. Because the ore is hard, and because of the limits of the primary crusher, the shovel is equipped with a 5-yd dipper. Two pieces of 1½-in. Bethlehem Wire Rope, 212 ft long, are used in the hoist line. The construction is 6 x 25 W improved plow steel, IWRC, Formset, one right lang lay and one left lang lay. Bethlehem 1¾-in. rope, in the same construction, is also used for the crowd and haulback lines. This is the kind of tough, all-weather application where Bethlehem Wire Rope performs at its best.

Bethlehem Steel Company, Bethlehem, Pa. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem Wire Rope

BETHLEHEM STEEL



Foremen's Forum (Continued)

it is the application of tested ideas that make the change.

However, change must be controlled if it is to be worthwhile. This control in our industry consists of the rapidly increasing application of industrial engineering principles to give direction and purpose to the technological advances. A few years ago methods research and industrial engineering were in the talking stages; now they are indispensable. This reminds us of a remark we heard about the value of programs in "public relations." It goes like this: Whether you know it or not, you already have public relations; the question is, are they good or bad? Well, the same is true of industrial engineering in a modern coal mine. You have it in one form or another, so you might as well make it good.

We shall see a lot more of it because management needs to know what might reasonably be expected from new equipment in local conditions before making the big investment. The foreman, we think, will spend an increasing amount of his time in helping to get this information to management. He will have to know at least the rudiments of the science.

Workmen will be different. In the first place there will be fewer of them. Those who remain will be highly skilled. Getting high performance out of today's and tomorrow's equipment is not a job for a dullard. Maintenance will be performed by technicians, hired by the coal company or employed by maintenance contractors who will provide the service for the coal company.

Whether these workmen are really loyal and productive is a question for management and supervisors to determine. They will be enthusiastic if they are motivated. This is management's responsibility—but that is another subject, so we'll drop it.

Safety will become more and more important as the decade moves along. It will no longer be possible to tolerate downtime resulting from accidents. The men, the equipment and the schedule, all of these will be too vital to the success of the venture to have them out of action through accidents. As usual, the primary responsibility for safety will rest upon the shoulders of you-know-who.

The Foreman in the 60's

We have taken our look at coal mining as it will develop in the coming decade. What will the supervisor's job require him to be and do? It will be nice if he is a broad-shouldered, slim-waisted, clear-eyed, level-headed individual. However, these characteristics

will be of no avail if he does not possess these five qualities:

1. Competence,
2. Adaptability,
3. Curiosity,
4. Pep and energy,
5. Instructing ability.

Let's investigate each of these to describe the foreman's job in the decade now opening.

Competence—An applicant for a supervisory position will be required to have his certificate, as always. However, the test or examination through which he receives this certificate may get tougher. There is a lot of new, important material that foremen must know, concerning ventilation, safe machinery use, roof control and so on. The applicant will spend a great deal of time in study before his examination, and if he gets a supervisory job he will spend perhaps more time in study and reading to keep abreast of the fast-moving technology.

Adaptability—Blind resistance to change and flightiness are the extremes the supervisor will have to avoid. Suggested changes will have to be studied for possible flaws and accepted or criticized on the basis of what advantages they can provide. Embracing a change merely for the sake of change is the flightiness in which no stable supervisor should engage.

Curiosity—The better foremen always have been those who have an insatiable desire to find out why things happen as they do. They are quick to notice effects, then they set out in a search for

causes. These men usually are the ones who generate good ideas because their curiosity helps them see the need for ideas. These habits of curiosity can be developed if some time and thought are given to their development.

Pep and energy—Clean and wide-awake in the cold, early hours at the beginning of the first shift, these are the marks of the peppy, energetic man. Zest for the job at hand is a reflection of good physical health and proper mental balance. The men will report for work in this condition if they, too, look forward to a productive day and if the situation at home is O. K. You may not be able to do much about the latter but you can give importance to the job, and that will help. These matters will become more important with time, as coal mining demands less brute strength and more clear thinking.

Instructing ability—In the dim, unlamented past orders were given, and that was that. Nowadays, the job is complex, which means that instructions rather than orders must be given. The need for clear, concise instructions will grow as the men get smarter and the job gets bigger. The foreman in the coming decade will have to think long and hard about the job to be done and how to explain it to the men who will do it.

Well, that's the burden of our message for this month. You have our best wishes for health, happiness and good fortune in 1960, and a better, more satisfying job in the Sixties.



IF YOUR MINE is participating in the 1960 campaign to reduce roof-fall injuries, these are the posters you should have on display, the one on the left in January, the one on the right during February.

LOOK—they're interconnectable!

*O-B "cap screw"
cable connectors*

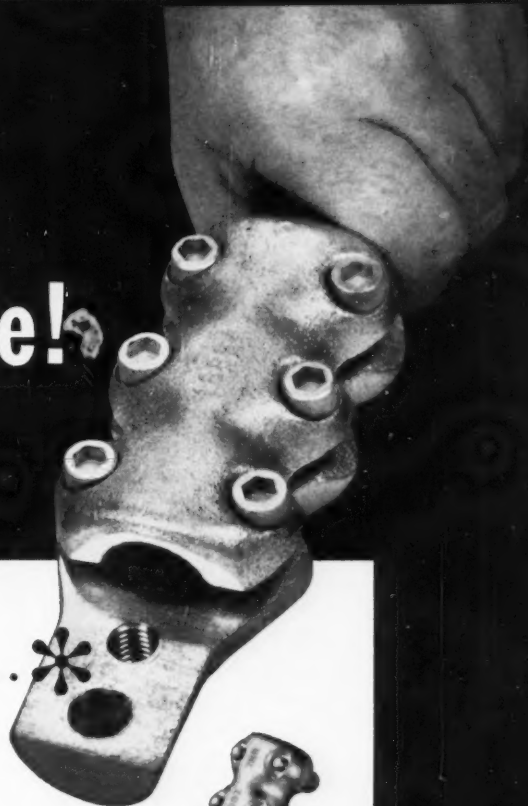
you can connect this...

- to any other single conductor cable
- either copper or aluminum
- from 4/0 to 1,590,000 CM
- same size or different size
- straight-thru, tap-off, or three-way
- simply by tightening two cap screws!

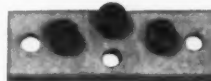
When you leave one of these O-B connector halves semi-permanently attached to the ends of your cable, you can make any of the above connections in a minute or two simply by tightening two cap screws. All connectors have ample strength, current-carrying capacity equal to or exceeding that of the cables themselves. Smooth, slim contours tape easily, drag over rough bottom without snagging. Ask your local O-B representative or write us today for more information.

OHIO BRASS COMPANY • MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

Straight-Thru Connector



Three-Way Plate



Tee Connector

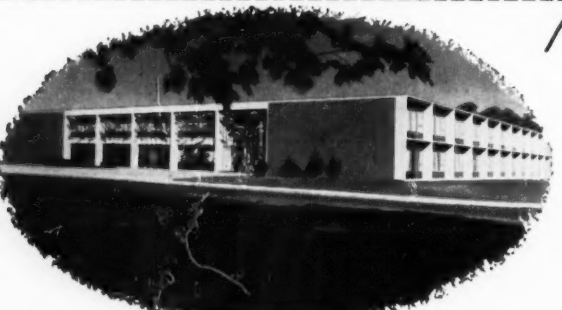
4829-M



DORR



**REVIEW
and
PREVIEW**



1959 has been a paradoxical year. With the public press reporting good business for the country as a whole, it has taken a discerning student to discover that the part of the economy relating to capital goods has only bettered to a modest degree. This fact, plus the low carry-over of orders from 1958, caused us to have an unhappy year financially.

However, with the modest but positive increase in business in the U.S.A. and the substantial increase in orders for most of our overseas areas, we look forward with confidence to 1960. Improvement of efficiencies in all internal departments has also been positive and is continuing both as to costs and the time it takes to do things. This naturally will be beneficial to our customers.

SANITATION—Once again this segment of our operations has played a dominant role in our worldwide business during the past year. Orders were placed with us and our subsidiaries to serve larger centers of population such as Trenton, New Jersey; New York City; Bagdad, Iraq; Chicago, Illinois; and Elizabethville in the Belgian Congo, as well as for smaller municipalities from Pierrefond, Ontario to Albertville, Alabama and from the Villa Carmen housing development in Puerto Rico to Harlingen, Texas. Two large U.S. corporations also will install D-O equipment in treatment plants constructed for a research laboratory in New York State and a West Virginia townsite.

Further proof of widespread acceptance of our newer developments is installation of a SpiroVortex system at Checotah, Oklahoma and of CompleTreator units at industrial plants, recreation centers, housing developments and military sites in the United States. Abroad, our Dutch subsidiary will install one of these units in a concrete rather than steel tank, and the first CompleTreator unit has been purchased in the Philippines. The latter, for a large refinery, represents the first export order for our manufacturing representative in Malaya.

New applications of proven equipment include use of the ODS pump for handling conditioning lime for sewage sludge filtration and fabrication of a plastic sludge filter. Also, development work continues on additional applications of our industrial equipment in the sanitary field.

SUGAR—Orders from new and expanding cane sugar factories in India for RapiDorr Clarifiers and Oliver-Campbell Filters contributed significantly to the business of our subsidiary in that country. And in other locations around the world—Mexico, British Honduras, Egypt, Mozambique and Swaziland, for example—these two units continued to be accepted as standard in the industry. In beet sugar, a British producer purchased First Carbonation Thickeners and Vacuum Filters for two new mills; and two Italian mills will use a total of four Vacuum Filters.

PETROLEUM—A variation of the initial application of the DorrClone Desanding System in fresh water treatment is the desanding of salt water used to recharge wells for secondary oil recovery at a West Coast location. Outside the U.S. our Japanese representative is fabricating filters for use in a catalytic cracking process and our British company will supply oil-water separators for both British and Brazilian refineries. Also of interest is equipment for a pilot plant to recover oil from tar sands.

PROJECT ENGINEERING—This phase of our operations was also particularly active in 1959 as design of phosphoric acid plants to be located in Idaho, Great Britain and Ireland and a phosphoric acid and triple superphosphate installation for Brazil was commenced. Also in the fertilizer field was a contract for process modification of a large British plant.

Late in the year, work was started on design of a large limestone crushing plant for which D-O will also purchase equipment and other materials. Our French subsidiary and domestic company working jointly virtually completed design of a large Yugoslavian copper concentrator. Two smaller but nonetheless significant projects—both including laboratory testing and feasibility studies—involved production of a limestone substitute to be used for self-fluxing sinter in blast furnace operation and the recovery of nickel from waste pickle liquors.

WATER—Conventional pre-treatment equipment will be utilized at D-O supplied water plants for a new steel mill in India, a military camp in Iraq and the municipalities of Wilmington, Delaware; New Castle, Pennsylvania; Saida in Lebanon; and Maracaibo and Niquata, Venezuela. Next year new PeriFilter systems will go into operation at New Oxford and South Pittsburgh, Pennsylvania and in 1959 a large system with two Hydro-Treator mechanisms went on line treating Midland, Michigan's water supply.

FluoSolids Systems—One of the new applications of the FluoSolids System this year has been preheating coarse shale in a special three-compartment reactor to produce light-weight aggregate. A second is drying iron ore before magnetic separation and concentration. Currently, the iron ore industry appears to have other drying applications ideally suited to fluidization. FluoSolids roasters are also under construction for a Canadian smelter where only partial sulfur removal is required.

Projects involving already proven applications have included in 1959 a pyrite roaster for a sulfuric acid plant on Formosa, three systems marketed by our Italian subsidiary for roasting pyrite to produce sulfur dioxide for pulp mill bisulfite cooking liquor and for a large zinc roasting installation in Yugoslavia, a large coal dryer for a Western producer, a copper-cobalt roaster in the Belgian Congo and detergent dryers in the United States.

METALLURGICAL—As in past years our work in this area has involved virtually all of the metallic minerals from gold to iron ore. The latter field has been among the most active with purchase of Sizers and Filters for Canadian washing plants, DorrClone classifiers for desliming prior to flotation and Thickeners, Filters and Pumps for recovery of blast furnace flue dust.

PULP AND PAPER—A new tool for this industry is a novel pressure washing filter. Installation of the first U.S. manufactured unit is being made in a Southeastern pulp mill. Ideally suited to brownstock washing, the unit has a number of advantages from both the operating and installation standpoints.

Recausticizing systems including process flowsheet innovations, such as precoat operation of the Lime Mud Filter and application of a two-compartment White Liquor Clarifier with special feedwell, were purchased for new or expanding mills in Canada, India, the United States, Portugal, Japan, Yugoslavia, Scandinavia and the Philippines.

Around the world the American Saveall continued to be recognized as the major means of recovering paper machine fibers from white water and in the U.S. the largest bleach tower designed to date will soon go into operation. An unusual and interesting application of the Merco Centrifuge is recovery of by-product material used as a drill mud dispersant at a West Coast mill.

CHEMICAL—During the year applications of the Plastic Filter, first introduced in mid-'58, were broadened to include a variety of fine chemical and pharmaceutical separations and washing of acid leach liquors from metallurgical pulps. Also in the realm of new applications is dewatering of various plastics using the Mercone Screening Centrifuge.

As usual, our standard line of equipment played a major role in a great number of Italian chemical plant expansions and in large new or expanded facilities in France, Germany, Spain, Mexico and here at home.

FOOD PRODUCTS—Successful application in 1958 of the Mercone-Precoat Filter combination for apple juice processing has resulted in orders from two West Coast packers for similar stations.

In starch, several domestic and overseas producers will employ D-O centrifugals of virtually every design for current modernization and process modification projects. Our Dutch subsidiary has put into operation three corn and potato starch washing and processing plants in Germany and Finland.

NON-METALLICS—A new clay and sand plant in Idaho will utilize considerable D-O sedimentation, filtration and centrifugal classification equipment and a Pennsylvania limestone producer has purchased Classifiers and a large Thickener for installation in an earthen basin. Also in the clay industry, the longest Oliver drum filters ever fabricated—24 feet in length—will be shipped early next year to a Southern producer.

We have noticed with much concern the apparent growing tendency of many users of services and equipment to buy almost exclusively on price rather than on demonstrated product quality and the essential engineering services made available to them during planning and after installation. This is not a new subject—and one on which there has been much forceful editorial comment in the technical press.

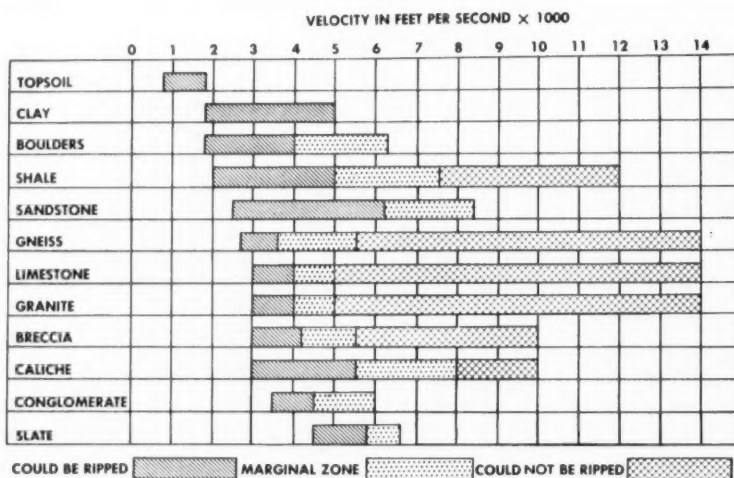
This practice confronts the supplier with the practical short range choice of sacrificing product quality and needed engineering, losing the business, or taking it at a loss. For our own part, we do not propose to fall into this trap which, economic considerations aside, can only result in arresting technological advance and which could have a profound effect on the leadership of the free world in things technical.

J. D. HITCH, JR.
Chairman of the Board

December 1, 1959

RapiDarr, SpiroVortex, CompleTreator, DarrClone, Hydra-Treator, FluoSolids, Merco, Mercone, T.M. Reg. U.S. Pat. Off.

Operating Ideas



TABLES such as this, compiled for each size of ripper, are useful in determining if subsurface material is rippable.

Velocity Tables Speed Seismic Analysis of Overburden

HERE'S a valuable and useful chart, developed by Caterpillar Tractor engineers, that shows how seismic wave velocities can be used to determine quickly and economically the rippability of various overburden material. Compiled from more than 500 field tests, the chart includes 12 different materials ripped by a D9 tractor with a mounted hydraulic ripper. A separate chart like

this must be made for each size or type of ripping equipment.

Seismic analysis is simple in theory—sound waves travel through materials of different consolidations at different, predictable velocities. The velocity of the sound or shock waves through the subsurface material provides the answer to "can it be ripped?" A full description of the seismic method of analysis ap-

peared in *Coal Age*, Dec., 1959, p 102.

The equipment weighs only 40 lb, is simple to operate and accurate. It includes a source of sound or shock wave (an 8-lb sledge), a receiver (a standard geophone) and an electronic counter.

Company personnel can learn to operate this equipment in less than an hour, following directions furnished by the manufacturer, Geophysical Specialties Co., Hopkins, Minn. The seismograph, including self-contained batteries, costs less than \$3,000. Working with the equipment for several days under known conditions personnel will quickly develop reliable accuracy of operation.

Accuracy has been established by running tests under known conditions and by checking ripper performance after tests. Results of these tests have been amassed into a set of tables similar to the illustration. Rippable and nonrippable velocities have been determined for each type of material. In almost every case, a zone of marginal material divides rippable and non-rippable categories. Rippability within this zone depends on soil conditions, machine conditions and skill of the operator. Consequently each company must determine rippability within this zone.

Satisfactory results cannot be obtained when the ground is frozen. This ground is so consolidated that the surface wave almost always reaches the counter ahead of the subsurface wave, regardless of the density of these lower layers. Likewise seismic analysis will not reveal the presence of softer material below harder layers, such as in cap rock area.

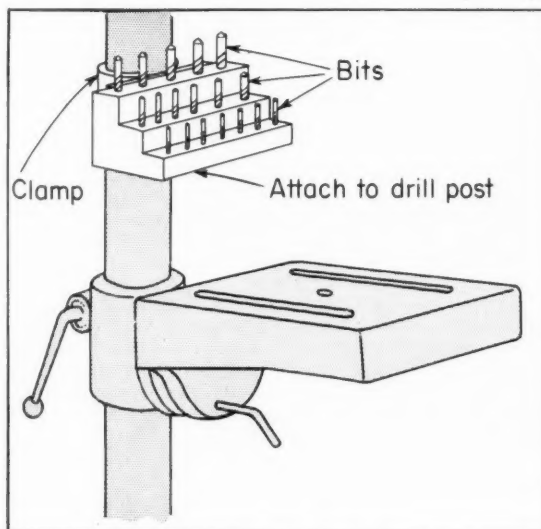
Bit Holder on Drill Saves Time

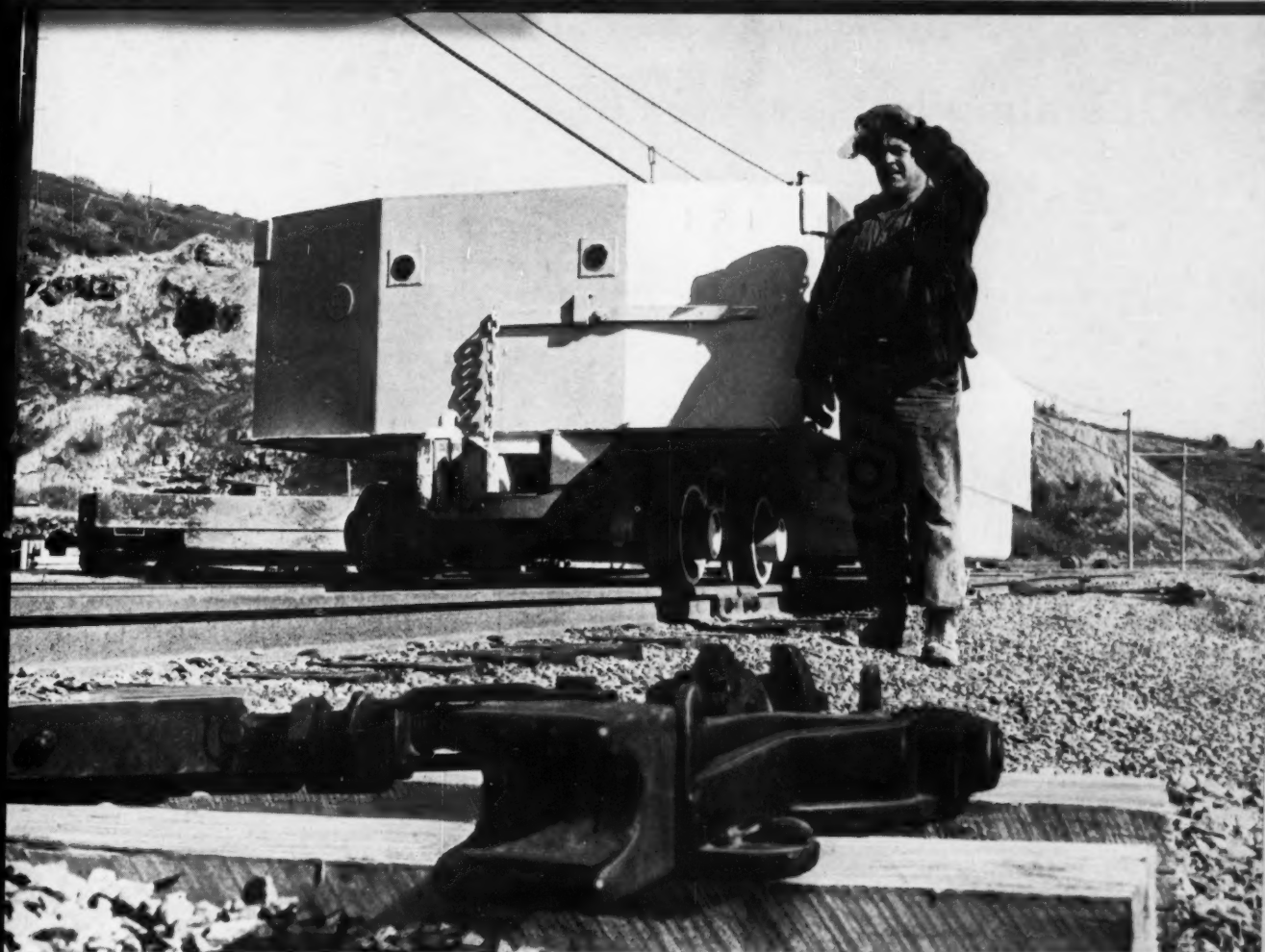
KEEPING the most used drill bits close at hand saves a lot of time, writes Charles H. Willey, Penacock, N. H. He made a drill-bit holder and fastened it to the drill column so bit changes could be made in a matter of seconds.

Starting with a piece of hardwood, Mr. Willey sawed it into a step-shaped block and drilled the required diameter holes to the proper depths. He then notched a wide-angle shallow vee in the back of the block so it could be positioned on the drill column.

A U clamp with feet holds the bit receptacle to the drill column. The clamp is the same size as the post column and is only deep enough to fit tightly when screws are driven through the legs.

Two or three of the most frequently used bits are always kept in the holder so a sharp one always is available when needed. When a job is completed, the drill bits are sharpened and put back in the rack.





Low, compact and sturdy *...Bethlehem model 1222 switch stand*



Here is a switch stand especially designed for long life in heavy-duty haulage service. Low and compact, the Model 1222 is a husky performer.

Only three moving parts: the lever, the crank, and the sliding block. None of these parts is located beneath the base of the stand; yet the mechanism stands only $3\frac{3}{4}$ in. from top of tie to bearing flange of the lamp tip. That's why it's ideal for use in cramped locations.

Operating on the sliding-block and crank principle, the 1222 develops great leverage for easy throwing. It is at its best in layouts built with 70-lb rail, or heavier.

You can use this stand in connection with standard rigid rod, or with Bethlehem's No. 11 SFU spring rod as shown in the illustration. It can be furnished with special crank to carry standard target lamp or target only. If you want additional details just call our nearest office, or write direct to us at the address below.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



Operating Ideas (Continued)

Starting Your Diesel Engine in Cold Weather

By Herb Orwig

Development Engineer, Trojan Div.
The Yale & Towne Mfg. Co.

PAST experience has shown that owners of diesel-powered equipment often have difficulty starting engines in cold weather because of a lack of knowledge about diesels. Since the combustion principles of diesels are different from gasoline engines, the starting technique is also different. An understanding of cold-weather diesel facts will enable the diesel owner to start the engine quickly and also eliminate possible engine damage through incorrect starting procedure.

Five Rules for Starting

1. Keep the engine in good operating condition. Good valve and ring seating provide maximum compression for easier starts and smooth running. Clean injector tips assure proper atomizing and even distribution of fuel.

2. Keep battery at peak charge. Low temperatures alone reduce battery efficiency and rob cranking power.

3. For best results use ether starting fluid or glow plugs as directed.

4. Keep fuel clean and lines free of water or air locks.

5. If shelter is available for your equipment, use it.

A diesel engine has no spark plugs so it relies on high compression to heat air in the cylinder enough to burn the fuel injected into it. When the engine is cold the metal parts rapidly absorb the heat in the cylinder and thus prevent ignition. This happens every cold day and, as a result, the engine needs help to get started.

Getting Proper Starting Conditions

Assuming the starter is turning the engine at normal speed, there are two ways to get proper starting conditions: (1) heat the air introduced into the cylinders; (2) help with a fuel that burns at a lower temperature than diesel fuel. In some open chamber diesels, such as Cummins, a glow plug is mounted on the intake manifold. When fuel is sprayed on this glowing element a small fire is kindled in the intake manifold and this heated air is drawn into the cylinder, giving enough boost to start the engine.

Engines with a precombustion chamber usually have a glow plug mounted in it so that ignition begins in a fractional part of compressed air in each cylinder where fuel is injected. Failure in starting with glow plugs usually comes because the operator is too impatient to let the plug heat fully before he starts cranking.

Ether and ether-base fluids have a lower flash point, or tem-

perature, at which they start to burn. This method is better liked because it gives instantaneous results. Ether fluids are high energy fuels and if used carelessly or too freely can cause serious mechanical engine damage because of abnormal compression pressures.

In an engine with a glow plug in the intake manifold never use ether and the glow plug at the same time. A nasty backfire or perhaps more serious damage could result.

Ether starting fluids are available in gelatin capsules, pressure capsules and aerosol-type pressure cans. Each form has its particular hardware to direct the ether to the engine intake manifold. All of them work effectively, so choose the one best suited to your needs. Both types of capsules are a "one-shot" unit while the aerosol can provides a more generous supply.

Very cold weather causes crankcase oil to become very thick. It is difficult for the oil pump to circulate thickened oil, hence the initial start starves cylinder walls and bearings of oil for a short time. It is especially important to avoid speeding the engine during this critical period.

Multiple-viscosity oils which are thinner when they are cold are available. These oils have a low-viscosity oil base with resins added and thicken as they warm. Diesel-engine makers have been reluctant to approve their use, therefore always follow your manufacturer's recommendation. If possible, drain the oil from your engine at the end of the working day. It can be warmed in the morning and added before cranking.

Most automotive-type diesels have an electric cranking motor as a utility starter. Under normal conditions most batteries are adequate but cold weather causes frequent failures. If your battery is in good condition but does not last long enough to start your engine, a larger battery will crank your engine longer.

Gasoline starting engines give unlimited cranking duration once started. Air starters are excellent since they usually give higher cranking speed. But a regular mobile compressor unit is usually needed to supply enough air.

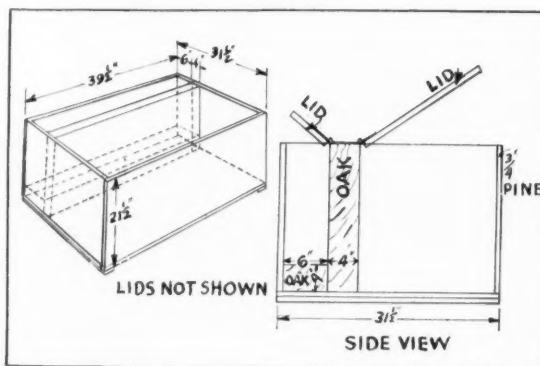
If a shed is available to shelter your equipment, use it. Fully enclosed sheds can be heated enough to be of real benefit in starting the engine since the air, crankcase oil and coolant all get the benefit of the warmth. Sometimes cylinder-head bolts may be replaced with special bolts having built-in electrical heating units. These heaters help by warming the coolant and require only standard 110-V power.

After your diesel is started it will warm up to its most efficient operating temperature faster if it is run through its work cycle at a moderate pace. A good rule is to let the engine temperature come up to nearly normal before demanding full engine power.

Better Explosives Handling

MOST sections of a mine have separate boxes for powder and caps, but some Eastern Gas & Fuel operations have switched to a two-compartment box which has a 4-in hardwood partition, according to *The Safe Mine Foreman*. Delivery crews leave a full carton of explosives for each empty one at the storage station.

Instead of dumping the new explosives into the storage box the explosive are dispensed from the factory carton. The company notes that this method prevents accumulation of deteriorated explosives and points out that the savings usually pay for the new two-compartment box in a few months.





**This No. 12 has to be dependable because
"if the trucks can't move, the mine can't operate"**

The Cat No. 12 Motor Grader, maintaining a strip mine haul road in Kingwood, W. Va., is a key machine.

"Keeping the haul road open for 14 to 27 trucks to move 1,000 tons of coal a day is vital. If the trucks can't move, the mine can't operate," explains C. G. Robertson, vice president of the Kingwood Mining Company. "The reason we use a Caterpillar machine is there is less down time and it's economical to operate."

This No. 12 operates the year around, 96 hours a week. It works over the 3½-mile haul road in just 4 hours. Other times it is used for clean-up work.

Constant improvements in the No. 12 have kept it the undisputed leader in its class. Here, for example, are the latest advances in this versatile machine:

(1) Clearance between the top edge of the blade and bottom edge of the circle has been increased to 5 inches. (2) Blade thickness has been increased to

7/8 inch and blade beams have been increased in length and thickness to handle heavier loads. (3) There's a new, stronger one-piece case for the transmission and final drive. (4) New mechanical controls reduce kick-back, provide easier engagement. (5) New blade controls feature a positive mechanical lock—exclusive with Caterpillar.

Ask for a demonstration of the improved, 115 HP No. 12 at your Caterpillar Dealer.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

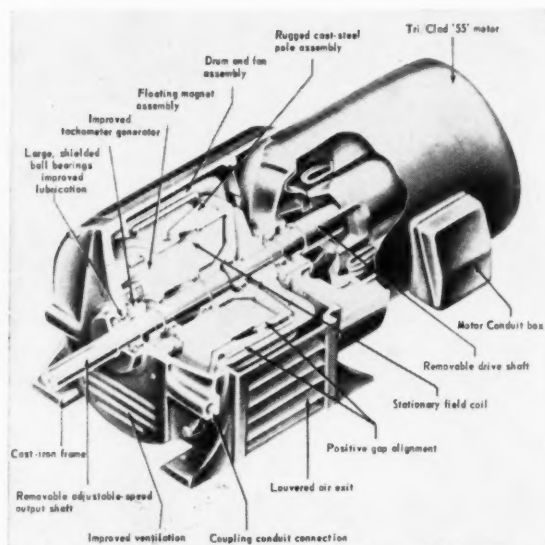
**LESS DOWN TIME,
MORE PRODUCTION...
CAT MOTOR GRADERS**

Equipment Developments



Adjustable Drives

New from General Electric Co., Schenectady 5, is the Kinacontrol line of eddy-current adjustable-speed drives from 5 to 100 hp. The standard AC package, featuring simplified design, with fewer moving parts for longer life, includes a drive unit, control enclosure (three types) and operator's station. A wide variety of control functions such as jog, thread or brake are available as modifications. The Kinacontrol drive is controlled from the operator's station which includes push buttons and a



speed-setting dial. Some features cited for the new unit by GE include: pre-wiring for quick, easy installation; versatile performance over a wide speed range with ratings through 20 hp; continuous operation down to 100 rpm at rated torque providing a speed range of about 17:1; and automatic control for close speed regulation. Generous bearing reservoirs provide continuous controlled lubrication for years of service without attention, and an advanced ventilation system gives cooler operation, greater speed range and quieter operation, adds the company.



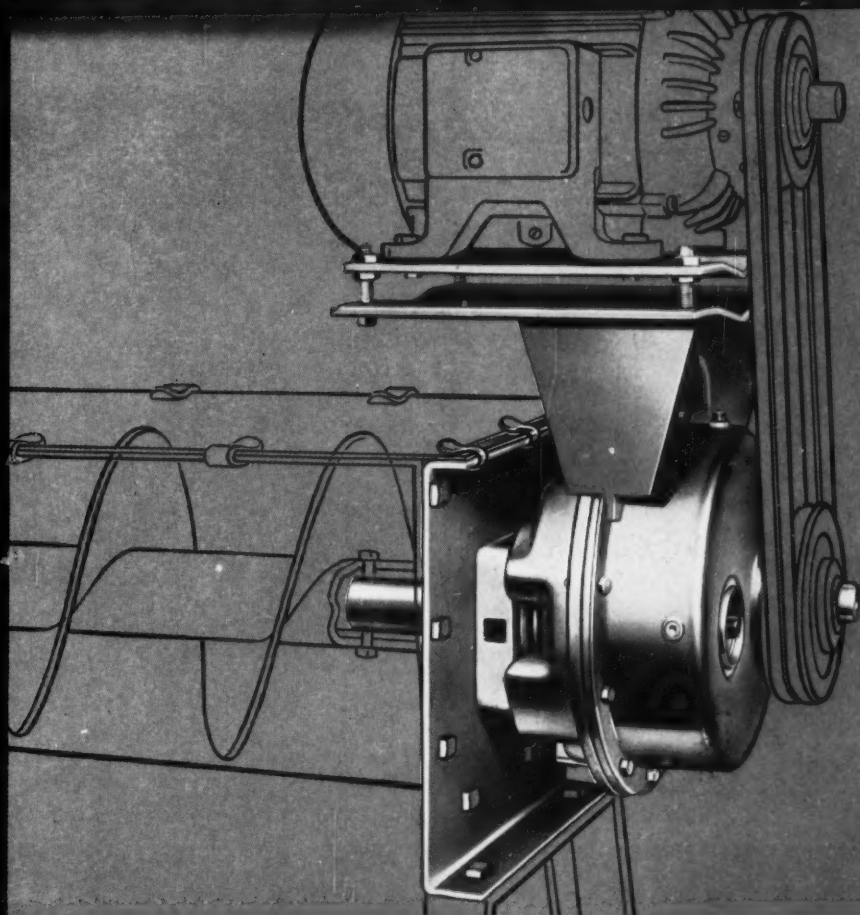
Hydraulic Scraper

Allis-Chalmers Mfg. Co., Milwaukee 1, is producing an all-hydraulic TS-360 motor scraper with 30-cu yd heaped capacity and 22.3-cu yd struck capacity. The 63,150-lb unit gets power from an AC turbocharged engine, developing 340 hp at 2,000 rpm. Hydraulic-bowl lift jacks assure tremendous force at the cutting edge, power being furnished by a tandem pump, gear-driven from the rear of the engine crankshaft, according to the firm. Double-acting steering jacks and multiplier links provide exceptional maneuverability, declares the manufacturer. The big 21000 engine combines fast acceleration and high torque output for fast get-away in the cut, sustained haul speeds and full power spreading on the fill, it is added.



Flexible Tandems

Coupling or uncoupling a second tandem scraper behind any of the three sizes of two-wheel prime movers or new four-wheel Speedpull, produced by LeTourneau-Westinghouse Co., Peoria, Ill., is now possible. The new system, which permits the equipment owner to double or halve his capacity, is made possible by a hitch-pin connection with quick-connecting plug-ins providing the hook-up for electric cables and air hoses. Total capacities with the tandems range from 18-cu yd in the D size to 56-cu yd in the Model B. The company stresses that the capacity-doubling process does not require a more powerful pusher because the scrapers are loaded one at a time, making loading resistance about the same as if there were only one scraper behind the power unit. The idea



NEW! FALK Screw Conveyor Drive

U.S. and Foreign Patents Applied For

— the drive our customers asked for

Our customers helped us design this new unit. We sent our men into the field to find out what our customers needed in a screw conveyor drive—then our engineers designed a new drive that offers the maximum of service, versatility, operating economy and long life. Here are some of its outstanding features:

A COMPLETE DRIVE: Saves engineering and assembly time. Six sizes to cover entire range—each with these ratios: — 4:1, 9:1, 14:1 and 24:1. Bolts to any standard trough end—eliminates trough end bearing. Eliminates drive shaft wobble. Efficient FALK single helical gears.

SEAL HOUSINGS: Choice of seals (neoprene or leather lip, felt or waste) to accommodate material conveyed. Space between trough seal and unit seal prevents conveyed material from reaching unit seal.

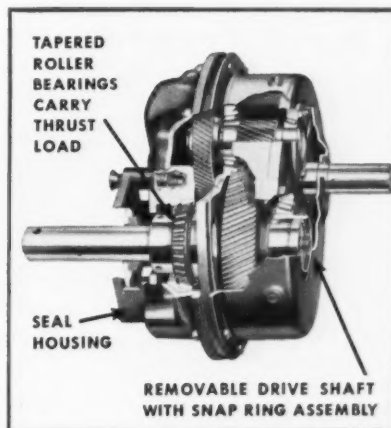
REMOVABLE DRIVE SHAFT: Snap ring assembly permits easy removal. Five sizes, from 1½" to 3⅞".

TROUGH END: Can be fastened to any standard trough. Eight sizes, from 6" to 20".

ALL-STEEL MOTOR MOUNT: Saves costly engineering and installation time and costs; no motor plates to design or fabricate. Motor can be mounted in virtually any position. Pre-drilled to accommodate NEMA standard motors ½ to 30 HP.

AN IMPORTANT ECONOMY: Buy only what you need—the basic reducer alone, or with trough end and/or motor mount. For detailed information, contact your Falk Representative or Distributor—or **write direct for Bulletin 7106.**

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in most principal cities



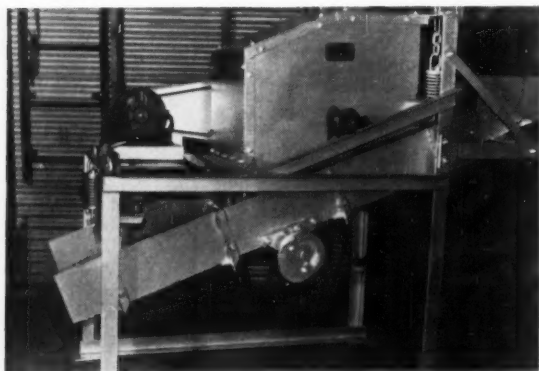
FALK is a registered trademark

FALK

...a good name in industry

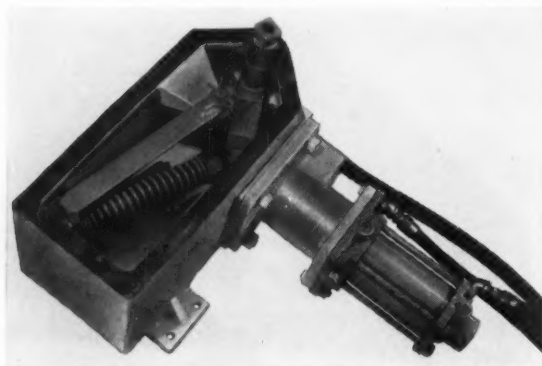
Equipment Developments (Continued)

is not new, the firm says, but the L-W system is more practical because it overcomes awkwardness and lack of maneuverability that might result from extreme length. This problem was solved by dispensing the front axle and wheels of the second scraper and letting it ride "piggyback" on the rear of the front scraper.



New Coal Sizer

A coal-sizing machine, said to be more efficient than conventional machines for breaking and scalping run-of-mine coal, is being marketed by S. B. McClung, Inc., Williamson, W. Va. Licensed to produce the machine by patent holder Russell Stafford, of McCarr, Ky., the company explains that the Stafford sizer's key feature is its ability to separate adherent coal from rock without breaking the rock. This results in retention of approximately 95% of coal that would normally go to the slate dump with the broken rock and slate. The McClung firm adds that this machine also may be used for reduction of prepared coal so as to conform to market requirements without the need for a secondary crusher.



Air Switch Thrower

A switch thrower operated by compressed air is available from The American Mine Door Co., Canton 6, Ohio. The firm, specializing in automatic track devices of various types, says it is possible to have the "Aero-Throw" entirely air-controlled by a manual contactor, or electrically controlled, AC or DC, with the use of several associated devices. The switch thrower is said to have all the mechanical advantages of the electric model, only substituting an air cylinder for

solenoids. It is noted that air power is to be preferred over the electric switch thrower because the solenoids in the electric device are vulnerable and eventually require replacement, whereas there is no appreciable wear on the air cylinders of the "Aero-Throw." Initial cost of the air switch with an electric control is slightly higher than an electric switch, but maintenance cost is considerably less, adds the manufacturer.

Improved Insulation System

"Epoxy-Mica" insulation, combining natural mica splittings with solventless epoxy resin through a vacuum pressure impregnation process, exhibits excellent insulation resistance, dielectric strength and thermal endurance, according to Motor Coils Mfg. Co., Cremo and Martindale, Pittsburgh 12, Pa., makers of the Epoxy-Mica-insulated coils for rotating machinery. Other features are high mechanical strength, rapid heat transfer through the void-free insulation, easier cleaning in vapor degreasers and good resistance to chemicals. Full information and bulletins are available from the manufacturer.



Adjusting Belts

A conveyor belt tension- and alignment-adjusting device using hydraulic pressure instead of screw take ups can trim belt adjustment time by 80%, reports Western Conveyor Co., Boise, Idaho. "Hydraligner," which provides variable positioning of conveyor pulleys, consists of a hydraulic cylinder attached to a bearing housing. Pressure from an ordinary grease gun moves the piston which is held in position by positive-action piston seals. The unit, adaptable to remote control through hydraulic lines, eliminates wrench work on rusty threads as well as digging or climbing by the operator who makes tension and alignment adjustments. The device may be adjusted safely while conveyor equipment is in operation, adds the company. The Hydraligner, mounted on a heavy-duty steel angle frame, comes in shaft sizes from $1\frac{1}{16}$ to $3\frac{7}{16}$ in. Standard adjustment stroke lengths are 14, 18, 24 and 36 in.

(Continued on p 138)



B.F. Goodrich tires haul 50 tons of coal over limestone roads

CENTRAL OHIO COAL COMPANY OWNS and operates the Muskingum strip mine in southeastern Ohio. Monthly production averages 200,000 tons of coal, carried from mine to dump by giant haulers. The one above carries 50 tons on the 8-mile trip over roads topped with crushed limestone.

There's a job for the toughest tires available—B.F. Goodrich Rock Service tires. BFG builds the Rock Service with a specially compounded tread that defies rock cuts and snags. Double-chevron cleats pull in forward or reverse, guard against dangerous skids.

And the B.F. Goodrich FLEX-RITE NYLON cord body withstands double the impact of ordinary materials. It resists such tire-killers as heat blow-outs and flex breaks. Result: more retreadable Rock Service tires and more retreads per tire!

Take a tip from successful mine operators—call your B.F. Goodrich Smileage dealer today. He is listed under Tires in the Yellow Pages of your phone book. He has a complete line of money-saving B.F. Goodrich tires for every type of mine work. *The B.F. Goodrich Company, Akron 18, O.*

Specify B.F. Goodrich Tubeless or tube-type tires when ordering new equipment

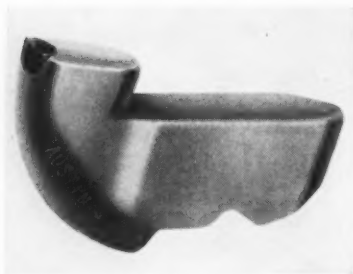


B.F. Goodrich *off-the-road tires*

Equipment Developments

New Diesel Tractor

Eimco Corp.'s Tractor Loader Div., Salt Lake City, Utah, is now offering its No. 103 crawler-tractor with a GM diesel. The manufacturer reports that the 103, with the 4-35 diesel, has maximum drawbar pull of 33,000 lb and zero track slippage. Featured are Eimco's Quadro-Torque and Unidrive as well as independent track control with full individual reversal on each. An independent hydraulic-pump drive permits simultaneous use of hydraulic, winch and hoist accessories.



BITS—A new carbide cutter bit that can be snapped quickly in and out of continuous miner chain blocks to reduce replacement time is announced by Austin Powder Co., Cleveland 13, Ohio. The Austin AP-20D is said to snap instantly over the retaining pin of the block to form a virtually vibration-free cutting edge. The bit can be easily snapped out for replacement and no lugs or set screws are needed, adds the company. An important feature of the bit is its 100% machined shank and positive bit and pin seats, says Austin. These are reputed to assure that each bit produces the same length cutting edge from each block.

AIR HOIST—A new air-powered hoist by Joy Mfg. Co., Pittsburgh 22, offers a choice of several throttle and brake systems which make it adaptable for hoist-

ing in mine shafts, car spotting and other uses. The hoist's lift capacity ranges from 27,000 lb at 37 fpm to 3,700 lb at 220 fpm. A five-cylinder radial air motor (10, 17 or 23 hp) with integral gear case drives the large rope drum through a multiple-roller chain. The drum has a capacity of 2,300 ft of 3/4-in wire rope. The hoist is mounted on a one-piece welded steel, skid-type base.



BELT CLEANER—A spring-type belt cleaner consisting of a row of thin, spring-steel wiper blades is a product of Stephens-Adamson Mfg. Co., Aurora, Ill. Said to be efficient and economical, the cleaner's individual-pressure blades are set perpendicular to the belt surface, but diagonal to travel of the belt. Pivoted connections between blades and

springs permit wiping edges of blades to seat uniformly on the surface of the returning belt. Blades overlap, wiping the entire surface clean without excess pressure or wear. The cleaner is available for any belt width.



NEW SHOVELS—Big capacity, high efficiency and extreme ruggedness are characteristics attributed to the new Lima Types 1800 and 1800-SC introduced by Lima Works, Construction Equipment Div., Baldwin-Lima-Hamilton Corp., Lima, Ohio. As a standard shovel, Type 1800 is equipped with a



**NOW! HERE'S AN ITEM THAT MEANS EXTRA SAVINGS!
It's The NEW REVERSIBLE RATCHET**



... costs less to change bits on continuous mining and cutting machines.
Now! you can loosen and tighten the set screws without removing the Wrench. Exclusive ratchet design changes direction of stroke in an instant. Works on any machine with 3/4" set screws. Fast, strong operation with solid, steel forged handle 18 1/2" long. Fits into openings where side clearance is only 1/2" ... box end handle design for "sledgehammer" jobs. Send for literature and prices—FREE.

Manufacturers of Mining Machinery Parts
Design and Engineering Service Available

NORTH AMERICAN GEAR COMPANY
39 East Campbell St., Blairsville, Pa.



RED BITS



NEW...

for faster bit changing



Send for new
Catalog VR-488
for complete
details

The new V-R Style CMC chain cutter bit is specially designed for use with the roller pin . . . bit changing time is greatly reduced. The pin holds the bit firmly in the block by wedging into the notch at the bottom of the shank. This newest V-R Red Bit contains the same superior carbide you've learned to expect from V-R . . . quality controlled from the ore to the finished product and backed by 30 years of V-R carbide research and manufacturing experience. Put rugged V-R Red Bits to work in all of your mechanized equipment for continuous trouble-free production.



CREATING THE METALS THAT SHAPE THE FUTURE

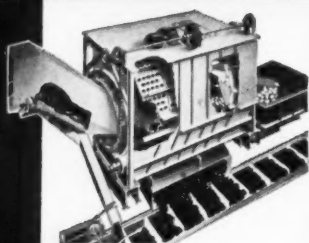
VASCOLOY-RAMET

862 MARKET ST.

WAUKEGAN, ILLINOIS

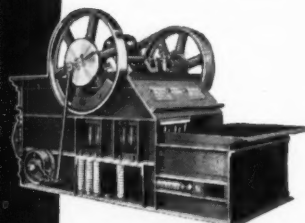
M-766

America's most complete line of CRUSHING EQUIPMENT



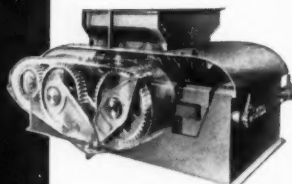
**McNally Pittsburgh
Rotary Breaker**

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



**McNally Norton Vertical
Pick Breaker**

50% Less fines when reducing lump to egg and stove sizes.



**McNally Double Roll
Gearmatic ROM Breaker**

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.



**McNally Gearmatic Stoker
Coal Crusher**

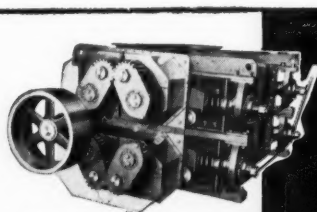
This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.

Equipment News (Continued)

35-ft boom, 26-ft 10-in dipper handle and 5-cu yd dipper. As a coal loading shovel it has a 7- or 8-cu yd dipper, and as a crane it has a lifting capacity of 112 tons. Type 1800SC is a 140-ton-capacity crane with ground-gripping stability, notes the firm. Extra-long crane booms with jibs are available for high lift work. Both the 1800 and 1800SC are air operated rigs and both are of such design that they can be knocked down for job to job transportation.



CONVEYOR—A new high-capacity conveyor for use in coal mines primarily with auger drills has been announced by The Fairfield Engineering Co., Marion, Ohio. Attachable to the auger so that it moves as the auger moves, the rubber-mounted conveyor has a capacity up to 210 tph. Discharge heights range from 10 to 17 ft and flight speed is 120 fpm. Optional features include hydraulic



McNally Two Stage Crusher
This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

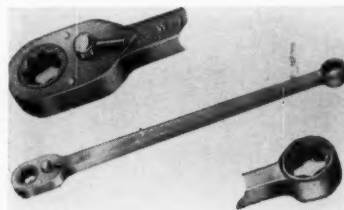
Available From Stock and on Short Delivery
For immediate action on complete information write,
wire, or call

McNALLY PITTSBURG MFG. CORP.

Pittsburg, Kansas

Wellston, Ohio

steering, hoisting and chute swing. A choice of electric motor, gasoline or diesel engine is available to fit the job and location.

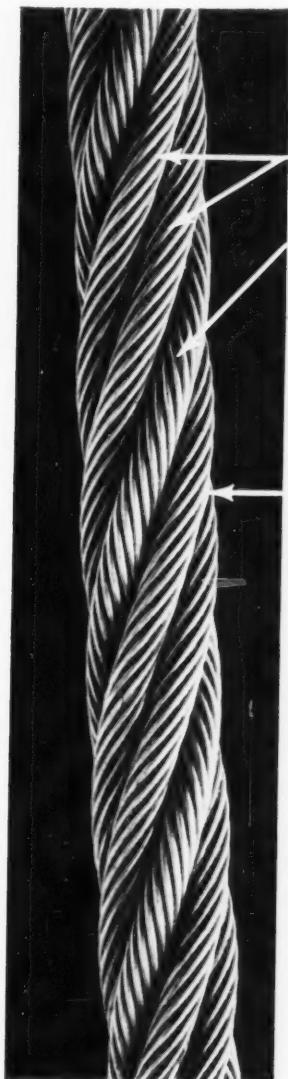


CHANGING BITS—Changing bits on continuous miners and cutting machines without removing the wrench for each stroke or for changing direction is possible with the new reversible ratchet bit wrench being produced by North American Gear Co., Blairsville, Pa. The heavy-duty wrench utilizes the most advanced tool design possible facilitating bit changing, saving time and money, says the firm. Designed for use on all machines using $\frac{3}{4}$ -in square head set screws, the wrench is useful in spaces where clearance is too small for conventional tools. The wrench is 18 $\frac{1}{2}$ in long and requires less than $\frac{1}{2}$ in side clearance.



NEW TRUCK LINE—Series 230 off-highway heavy-duty trucks with choice of gasoline, LPG, or diesel-powered engines has been introduced by the Motor Truck Div. of International Harvester Co., Chicago 1. The series includes six basic models in both four-wheel and six-wheel designs and offers gross-vehicle-weight ratings from 46,000 to 73,000 lb. Components have been engineered for long life and dependable service under heavy loads, says the firm. Design features include diamond-plate steel fenders, heavy-duty brush guards, double-channel heat-treated frames, two new rear axles and a broad selection of optional components. Power steering is standard on all models.

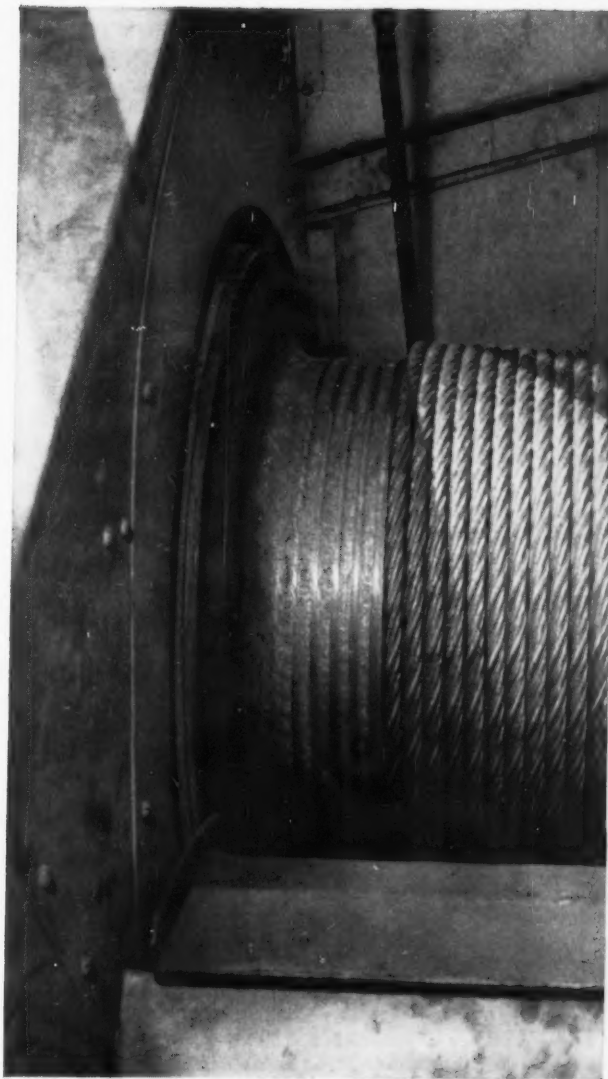
MODERNIZATION—Kits for rehabilitating and modernizing locomotives ranging from industrial and mine haulers to main-line units worth \$2 to over \$2,000, are being provided by the Repair & Renewal Parts Sales Section of Gen-



Herringbone's two pairs of Lang lay strands and one pair of regular lay strands provide the ideal combination of maximum flexibility with good stability.

Finer wires inside contribute to Herringbone's excellent drum-winding characteristic.

Heavier outside wires in each strand have greater resistance to abrasion.



**“... we
would
never
hesitate
to recommend it”**

GRAY & FEAR, CONTRACTORS

This company continues: “We have been using your Roebling Herringbone* for about one year. We find it is one of the best ropes we have ever used, outlasting previous ropes three to one. It is good that such a reliable rope is available.”

This is a direct field quote on the most remarkable development in wire rope in years...a new concept in wire rope design. Roebling Herringbone is the regular lay and Lang lay wire rope—two-ropes-in-one rope—combining the best features of both.

Herringbone delivers extra flexibil-

ity, extra abrasion resistance, unusual structural stability, extra resistance to shock, easy operation over sheaves and drums and smooth spooling properties.

We recommend Herringbone without reservation for general hoisting and the entire range of heavy-duty equipment. Your Roebling Distributor or Roebling's Wire Rope Division, Trenton 2, New Jersey, will give the full and fabulous details. *Reg. App. For

ROEBLING 
Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation



COLD CURE FOR HOT PROBLEM



• **BUFF DAMAGED AREA.** Repair on location. No need to dismantle conveyor.



• **APPLY VULCANIZING SOLUTION.** Your own maintenance crew can save belts easily with PANG process.



• **MIX SELF-VULCANIZING COMPOUND.** PANG rubber can be used on any size area, more than one area at a time, and along edges—any length.



• **SPREAD OVER DAMAGE.** PANG cures itself into a tough, resilient rubber and vulcanizes permanently onto rubber or fabric.



WRITE FOR CATALOG AND PRICE LIST • AUTOMATIC VULCANIZERS CORP. • 16 HUDSON ST., NEW YORK 13, N. Y.

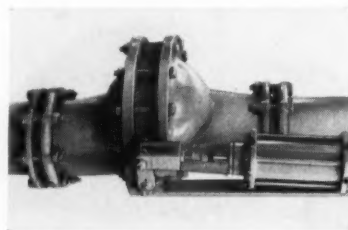
Equipment News (Continued)

eral Electric Co.'s Locomotive & Car Equipment Dept., Erie, Pa. Kits are available for almost every modernization aspect, such as a newly developed valve seat for magnet valves, complete refurbishing of the control cab, two-way radios and a variety of accessories to make the operating engineer more comfortable.



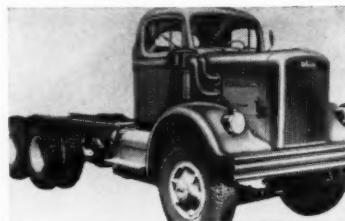
TRANSMISSIONS—LeTourneau - Westinghouse Co., Peoria, Ill., announces that there are now two transmissions available for the Model D Tournapull: a torque converter or conventional manual-shift-type transmission. The new torque converter version of the prime mover can be had with any of the standard D Size interchangeable trailing tools, including the 9-yd scraper, 11-ton rear dump or 10-ton mobile

crane. The new transmission is being built for L-W by the Allison Div. of General Motors Corp. A feature on the D Tournapull with Allison transmission is an automatic lock-up clutch. This provides maximum operating efficiency and economy, eliminating power-consuming slippage in the converter at haul speeds, notes the firm.



SLURRY VALVE—United Conveyor Corp., Chicago 26, has developed a new valve for abrasive slurry applications. It can be installed in any position and has no slots or guides interfering with valve movement. Maintenance is reduced to a minimum since there are no sliding metal-to-metal parts to wear out, says the firm. It will hold tight against pressure from either direction up to 150 psi and there are no slots or guides to fill up with dust, notes the firm. In-

stallable in any position and operated remotely with air or hydraulic cylinder, the valve is self-draining, wear-resistant and easily serviced.



OFF-HIGHWAY TRUCKS—Three new off-highway trucks have been introduced by the White Motor Co., Cleveland 1, giving the firm a complete line of single- and tandem-axle trucks for off-highway work. One of the new units, Model 4400D-OH, is diesel powered and has single rear axle. The others—the single-axle Model 4200-OH and tandem-axle 9064-OH—are driven by White Mustang gas engines. The models have double-channel frames of heat-treated chrome manganese steel with bolt-and-nut construction instead of rivets for maximum strength and efficiency.

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING • GROUT HOLE DRILLING

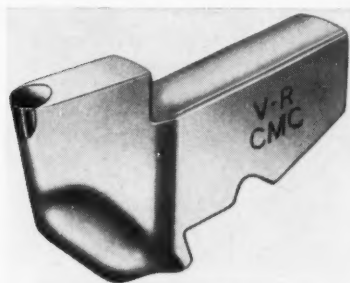
Skilled crews and complete stock of core drills and accessory equipment maintained at all times

Core Drill Contractors for more than 60 years

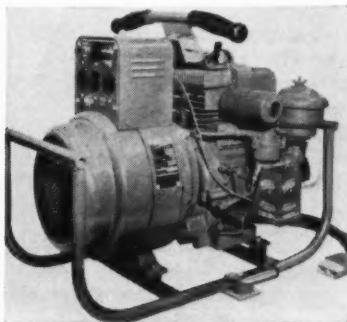
JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

COMPRESSOR—Schramm, Inc., West Chester, Pa., has available an improved 600-cfm air compressor. The supercharged compressor of the new Model 600-TC is driven by the Schramm version of the turbo-charged UDT-1091 International diesel engine which puts out over 25% more horsepower than other engines of similar capacity, says Schramm. Because of its low operating

speed of 1,200 rpm, declares the firm, the engine requires less maintenance and servicing and gives longer life.

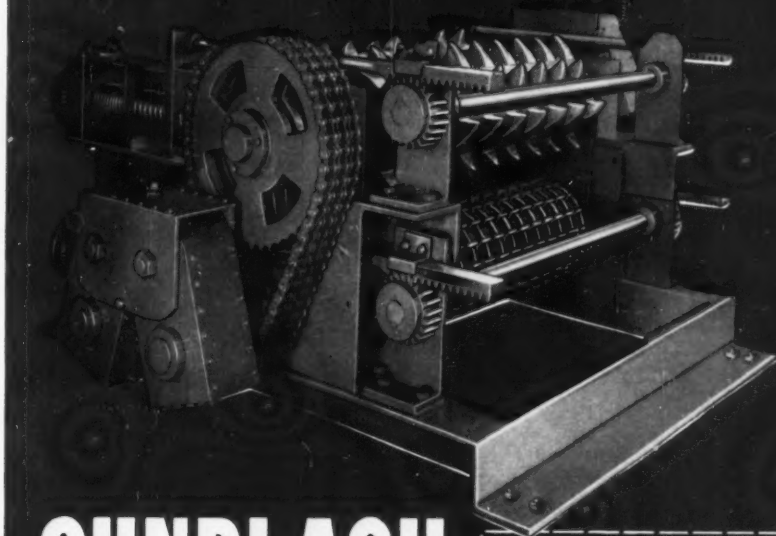


BIT CHANGING—Rapid bit changing and prevention of carbide tip loss are featured in this new chain cutter bit for pattern-cutting-type continuous miners and universal-type miners. Made by Vascoloy-Ramet Corp., Waukegan, Ill., the bits reduce changing time through use of a new-type roller pin block design, declares the firm. The cylindrical tip is brazed into a cylindrical pocket for the greatest possible mechanical holding power, enabling the bit to withstand extremely rugged cutting conditions without tip loss, it is added.



PORTABLE GENERATOR — Portable power for lights, portable tools, smoke ejectors or other fire-fighting equipment is provided by fast-starting engine generators from Wincharger Corp., Sioux City 2, Iowa. Coming in two sizes, the Winco Fire Lite (3,000 W) and the Fire Mite (1,500 W), the models feature an idling control which reportedly saves up to 60% in fuel.

HYDRAULIC TRANSMISSION — A new 1½-hp hydraulic transmission developed by Roberts Mfg. Co., Chicago 22, gives infinitely variable speed from 0 to 350 rpm in either direction. Forward and reverse speeds can be set identical or different. Features include instantaneous reversing, neutral (0 rpm) position and integral-torque multiplier for high torque applications. With ball and roller bearing throughout, the unit, coming in single or three-phase 60 cycle, is said to be ideally suited to heavy-duty applications where variable speed



GUNDLACH

Takes the Crushing Problem DOWN TO SIZE!

YOU BENEFIT...

By Control of Top Size — Crushing to size in one operation eliminates recirculating load ... saves time and equipment ... increases overall plant capacity.

By Less Fines — More saleable coal in stoker sizes means more dollars per ton ... if crushing prior to washing, fewer fines means lower washing costs.

By Flexibility ... Can handle larger lumps and frozen coal ... hand wheel adjustment allows you to fill any order down to ¾" top size ... orders heretofore uneconomical to fill are now yours.

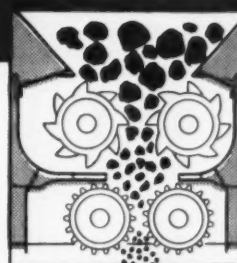
By Dependability ... Ever-increasing list of satisfied users.

By Economical Operation ... Less maintenance ... Less H.P. per ton of crushed coal ... One Crusher ... Lower initial investment ... No wasted labor in adjusting crusher.

YOUR CUSTOMER BENEFITS...

By Control of Top Size ... Less unburnt coal in ashes ... More BTU output per ton ... Lower ash handling costs ... Greater overall utilization.

By Less Fines ... Simplifies unloading ... increases boiler efficiency.



Uniformity in size consist of GUNDLACH crushed coal eliminates customer complaints, gives customer satisfaction, and increases production.

If you have a crushing problem, you'll find a GUNDLACH representative as near as your telephone.

OUR REPRESENTATIVES AT YOUR SERVICE

ANDREW M. GARDNER, 626 Park Lane, Greensburg, Pa., TE 4-4346 • MARSHALL EQUIPMENT CO., P.O. Box 1367, Huntington 15, W. Virginia, JA 3-8691 • CLYDE E. CLARKSON, 4831 E. Harvard Lane, Denver, Colo., SK 6-5277 • J. SCHONTHAL & ASSOC., INC., Suite 309, 224 S. Michigan Ave., Chicago 4, Ill., WA 2-8350 • A. R. AMOS COMPANY, 713 Commercial Trust Bldg., Philadelphia, Pa., RI 6-3675 • RICHARD M. WILSON, 27 Oak Park, Wheeling, W. Virginia, Woodsdale 586.



**T. J. GUNDLACH
MACHINE CO.**

P. O. BOX 283 • BELLEVILLE, ILL.

Division of J. M. J. Industries



Style GR, cylindrical insert



HR Style, 1 1/2" gage stop



JN for continuous miners



HJN recovery auger bit



G Style, straight shank



Style GN, notched shank



JC Colmol and Boring bit



GV, for Joy GV-6111 chain



KN Style, chisel-nose tip



HN Style, 1 1/2" gage stop



Style A straight shank



Style C for impurities



Style D for coal, potash, salt



Style E for Goodman Borers



Style CC, milled shank



L Style for Bowditch ML chains

CARMET OFFERS 25 STYLES OF MINING TOOLS

for every condition you have

Carmet carbide mining tools get high-tonnage production because they're precision made to meet specific mining operations. Hard, tough grades of carbide are induction brazed to high alloy, heat treated shanks in a way that insures maximum tool life. Cutter bits are designed for shortwall, longwall, universal machines and continuous miners of every make. Drill bits drill clean, straight holes at fastest speeds. Carmet distributors keep a complete line of Carmet Mining Tools in stock for prompt delivery. Carmet field engineers are always on call to help you solve tool problems and cut mining costs. Take advantage of their know-how now.

NEW CARMET MINING TOOL CATALOG NOW AVAILABLE FROM YOUR CARMET DISTRIBUTOR

Brace-Mueller-Huntley, Inc.
Offices: Buffalo, Rochester & Syracuse, N.Y.
Carbon Transfer & Supply Co., Helper, Utah
Carlsbad Supply Co., Carlsbad, New Mexico
Consolidated Supply Co., Picher, Oklahoma
Crandall Eng. Co., Inc., Birmingham, Ala.
Drillmaster Supply & Mfg. Co., Evansville, Ind.
Gladstein Co., McAlester, Oklahoma
Marion Mine & Mill Sup. Co., Whitwell, Tenn.
McCombs Sup. Co., Jellico, Tenn.; Harlan, Ky.
Oglebay, Norton Mine Supply Div.,
Offices: St. Clairsville, Ohio;
Johnstown, Pa.
Persinger Supply Co., Williamson, W. Va.
Persinger's Inc., Charleston, W. Va.
Union Supply Co., Denver, Colorado
U. S. Steel Supply Co., Pittsburgh, Pa.
W. B. Thompson Co., Iron Mountain, Michigan
Vanguard Equip. & Supply, Chicago, Ill.

The newly revised 5th Edition of the Carmet Mining Tool Catalog contains application data and specifications on the complete line of Carmet Mining Tools, including a complete section on grinding and reconditioning. For your copy, write Carmet Division, Allegheny Ludlum Steel Corporation, Detroit 20, Michigan.



ADDRESS DEPT. CA-25



N Style special clearance bit



O Style for rotary head miners



R Style finger bits



Style UL coal drill



Style VL drill bit



W Style for friable seams



WW Style, power and hand drilling



T and TT Styles for roof bolting



S and SS Roof Bolting drills

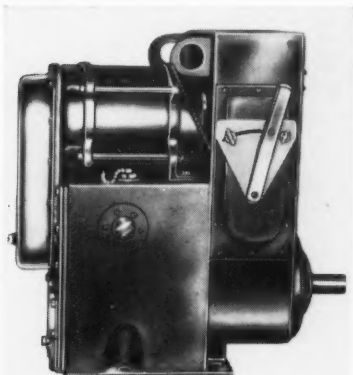
The Original DOUBLE-BONDED Carbide Cutter Bit

CARMET



WSW 7209

Equipment News (Continued)



and instant reversing can increase production and efficiency.

MAGNET PULLEYS—A complete line of Indox V permanent-magnet pulleys, in diameters up to 48 in., is now being offered by Stearns Magnetic Products, Milwaukee, Wis. For the first time, says the firm, all the advantages of low-cost permanent magnet pulleys can be utilized for such heavy-duty applications as mining operations and in coal-burning power plants. Indox V, a highly oriented barium-ferrite ceramic magnet material, provides performance equal to the most powerful electromagnetic types at much lower costs, according to Stearns.

Free Bulletins

I-H Equipment—Four bulletins from International Harvester Co., Chicago 1, discuss a variety of products. No. CR-1076-I bulletin describes loaders and backhoes matched with I-H tractors. CR-665-I is entitled "International Production Equipment For Modern Mining," and CR-608-I handles a six-cylinder diesel engine just put out by the company. Another catalog features the new International TD-9 crawler tractor. Sketches and illustrations supplement explanations in the publications.

A-C Items—Allis-Chalmers Mfg. Co., Milwaukee 1, has five pamphlets available on its equipment lines. One publication tells of 21 modern advantages of the A-1 jaw crusher while another is a catalog guide of equipment for the process industries. A new motor-control digest with 162 pages is also available as well as Catalog MS-1274 on torque-converter-drive tractor shovels. Also offered upon request is literature describing the firm's three styles of single-stage scroll-casing compressors.

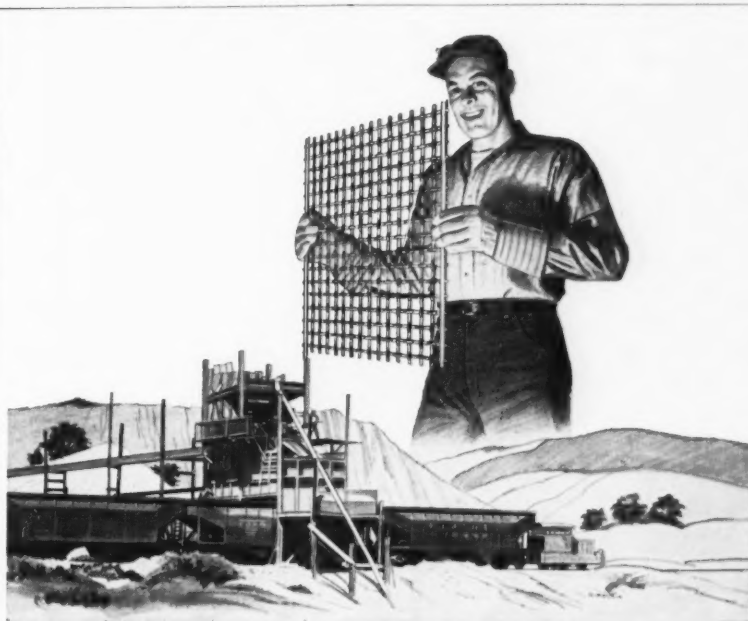
Diesel Engines—"Defeating Dirt" is the name of a new series of bulletins

just published by Cummins Engine Co., Columbus, Ind. They give, in concise, illustrated form, how to care for diesel engines to obtain maximum performance, economy and engine life. Special tips on reducing down time and repair costs are featured.

Power Systems—A new catalog on its line of Multi-Luber automatic power lubrication systems for trucks, trailers, material-handling equipment and industrial machinery has been published by Lincoln Engineering Co., Div. of The McNeil Machine & Engineering Co., St. Louis 20.

Drives—Booklet GEA-6806 from General Electric Co., Schenectady 5, N. Y., describes the new ¼- to 25-hp line of Polydyne mechanical adjustable speed drives produced by the firm. Benefits, principles, operation and related factors are handled thoroughly.

Caterpillar Machinery—Three colorful illustrated booklets are available from Caterpillar Tractor Co., Peoria, Ill. One booklet explains how the new Synchro-Touch transmission control operates, and another gives working details and mechanical relationships of the Power Shift transmission, recently introduced by the



CF&I Space Screens

reduce cost by cutting downtime

This Image—the CF&I giant steelman—reflects CF&I's experience and versatility as a primary producer of quality steels and hundreds of steel products for industrial use. And the CF&I Image is your assurance of durable, accurate space screens.

Because CF&I Space Screens are designed to give long service life, you have fewer work stoppages due to screen failures, and your cost-per-ton screened is reduced. The types of wire, weave, crimp and edge preparation are chosen to give maximum

performance under specific job conditions. Included in the types of screens available are Super Tempered Screens, made from a special oil-quenched wire, and Wisscoloy Screens, made from a special alloy steel wire. The wire in each screen is crimped to close tolerances for accurate spacing, and woven extra tightly on heavy-duty hydraulic looms so that spacing remains uniform during use.

For engineering assistance and prompt, dependable service, call the CF&I sales office nearest you.

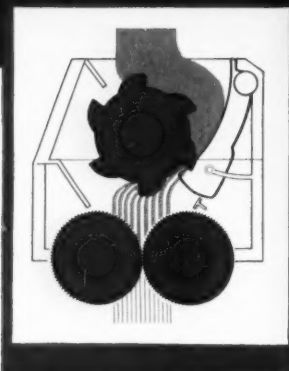
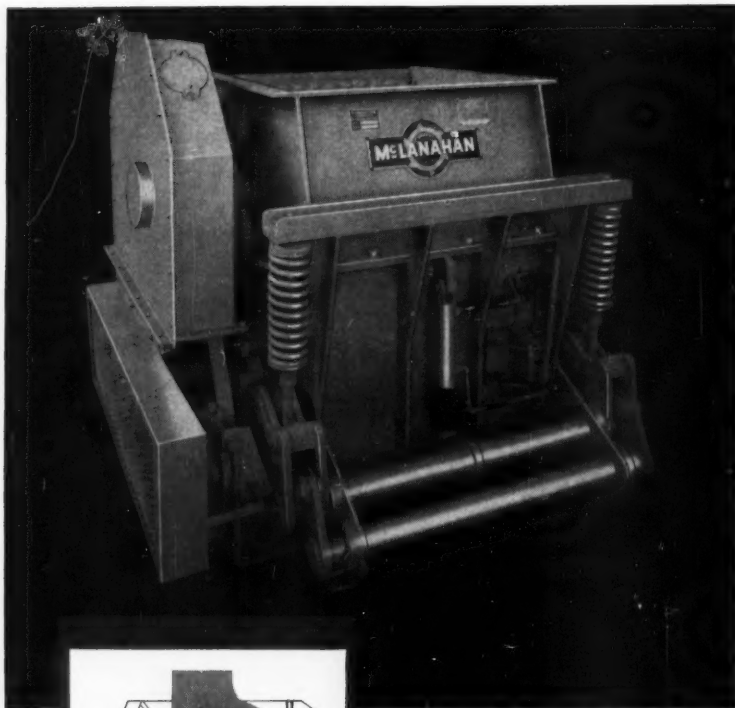
6623-B



CF&I SPACE SCREENS
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: WICKWIRE SPENCER STEEL DIVISION Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal • CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

IMPROVED TWO-STAGE CRUSHER



More uniformly-sized product results from this two-stage combination: Large-diameter toothed roll does the primary work against a curved crushing plate; with double rolls performing the secondary reduction.

The McLanahan Triple Roll Crusher . . . which reduces run-of-mine coal and open pit feed to $\frac{1}{2}$ " and smaller in a single pass . . . has been refined to make it even more adaptable for high-tonnage operations. Rolls now are gear driven, and larger size rolls are available.

NOW AUTOMATIC TOGGLES, an optional feature, protect against tramp iron. Attached to the movable secondary roll, the Toggles open to pass uncrushable material, then immediately return the roll to the original setting—without stopping the crusher.

Ask for New Bulletin TR-20.



TRIPLE ROLL CRUSHER

Equipment News (Continued)

firm. "Mine More" is another available publication that tells how to increase profits and output on mining jobs. An 11-min sound film introducing and illustrating a new concept in big tractor power transmissions is also obtainable through Caterpillar dealerships.

Power Cables—A completely revised bulletin on portable and power cables for the mining industry has been issued by General Electric's Wire & Cable Dept., Bridgeport 2, Conn. Portable and power cables for both AC and DC systems for all phases of mining are covered.

Reducers—Information on a complete line of helical-gear speed reducers is contained in Booklet 2751 just published by Link-Belt Co., Chicago 1. The 20-p publication consolidates all of the company's expanded line of In-Line speed reducers in a single catalog. Link Belt also has available Booklet 2540 called "Die Crown Welded Steel Pulleys," containing detailed engineering and selection data.

Welding—An 8-p bulletin has been released by the Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa., covering gas welding rods. Included are analyses of the rod, recommended uses, welding procedures and physical properties.

Pulley, Conveyor — Stephens-Adamson Mfg. Co., Aurora, Ill., has two bulletins available. Bulletin 558 discusses the new "Curve Crown" welded all steel pulley. The other booklet, No. 458, features a new pre-engineered sectional belt conveyor the company is marketing.

Blocks, Drives — Browning Mfg. Co., Maysville, Ky., has readied two new catalogs, BU-102-A on malleable tapered roller pillow blocks, and GB-201A on gearbelt drives. Descriptions, illustrations and specifications are provided.

Electric Drives—A 12-p booklet giving detailed performance and application data on the complete line of Reliance all-electric, adjustable-speed VS Jr. drives, is available from Reliance Electric & Engineering Co., Cleveland 17. Drives from $\frac{1}{2}$ through 4 hp are covered with photos and cartoon drawings.

Tractor—Euclid Div. of General Motors Corp., Cleveland 17, has just released a brochure on Model C-6 crawler tractor. Another 24-p catalog on Model TC-12 twin power crawler tractor is also available from the firm. Features, performance and specifications make up the pamphlets.



How to simplify lubrication underground

By using *multipurpose* oils and greases, you can drastically reduce the number of lubricants needed for your underground equipment. In some mines, Texaco Lubrication Engineers have even gone so far as to set up an effective lubrication program using only two lubricants!

Think what a simplified lubrication plan like this could save you—in storage and handling costs, in reduced inventory and, above all, in eliminating the dangers of misapplication. And—you could ask no better assurance of dependable, uninterrupted production and lower maintenance costs.

Let a Texaco Lubrication Engineer work out a simplified lubrication plan for your operation. Just call the

nearest of the more than 2,300 Texaco Distributing Plants, or write to:

☆ ☆ ☆

Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon.-Fri.-NBC-TV

TEXACO 
Throughout the United States
Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Among the Manufacturers

Fairmont Supply Co., Div. of Fairmont Machinery Co. which is wholly owned by Consolidation Coal Co., has purchased Somers, Fidler & Todd Co., Pittsburgh, distributors of industrial supplies.

In addition, Fairmont Machinery Co. announced the acquisition of all the outstanding capital stock of Lecco Machinery & Engineering Co. of Bluefield,

W. Va. Lecco makes horizontal and inclined vibrating screens and conveyors.

Conveyor Belt Service, Inc., has organized a new operation in Cleveland to be known as Conveyor Belt Service, Inc., of Ohio.

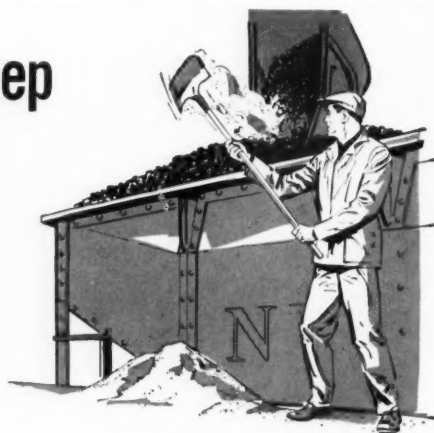
The firm will provide repair and reconditioning service for various types of conveyor belting.

Frank Prox Co., Inc., has appointed the Marshal Equipment Co., Inc., Huntington, W. Va., as their sole sales representative in the West Virginia, eastern Kentucky, Tennessee and Virginia areas.

J. M. J. Industries, Inc., and its T. J. Gundlach Machine Co. Div. have their new plant in Belleville, Ill., ready for production.

The organization manufactures and supplies crushing equipment for the coal industry.

How to keep customers happy—all winter long



Treat all shipments with Sterling Rock Salt, and your customers will be able to unload coal *fast* even in freezing weather. They won't have to thaw your cars or loosen coal by hand. Customers will gladly pay the small premium for coal that is treated so it won't freeze up! You can apply Sterling Rock Salt quickly, too. Just three or four bags of this effective anti-freeze agent will keep an entire carload of coal from freezing! (It takes only 5 lbs. of Sterling Rock Salt to protect one ton of bituminous; 5-8 lbs. for anthracite.)

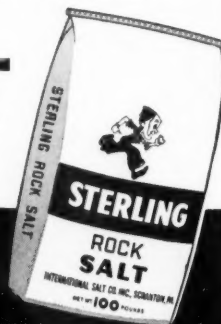
You can also use Sterling Rock Salt to prevent frozen scales and switches . . . to keep roads and yards clear throughout the winter. It removes snow and ice *fast*. Comes in bulk carloads or packed in 100-lb. bags.

Free folder gives further information on Sterling Rock Salt for mines, collieries. Ask your Sterling representative or write to INTERNATIONAL SALT COMPANY, INC., DEPARTMENT CA-1, SCRANTON, PA.

SALES OFFICES: Charlotte, N. C. Detroit, Mich. New York, N. Y.
Boston, Mass. Chicago, Ill. Newark, N. J. Philadelphia, Pa.
Buffalo, N. Y. Cincinnati, Ohio New Orleans, La. Pittsburgh, Pa.
St. Louis, Mo.

STERLING ROCK SALT

INTERNATIONAL SALT COMPANY, INC.



Basile



Lehti

C. M. Basile has been elected president of Link-Belt Speeder Corp., manufacturer of power cranes and shovels, to succeed D. W. Lehti, who retires after 25 yr with the company.

Mr. Basile has been with the subsidiary of Link-Belt Co. since 1950. Since coming to the firm, he has been a director and vice president in charge of operations. Earlier this year he was elected executive vice president of the Cedar Rapids, Iowa, plant.

William E. Meador has been named assistant sales manager of The Long Co., mining equipment manufacturer.



Meador

Mr. Meador, a 1953 business administration graduate of Virginia Polytechnic Institute, joined Long in January, 1957. He has been southern West Virginia sales representative since July, 1958. A native of Mullens, W. Va., he spent 2 yr. in the Army emerging as a first lieutenant.

For Eimco Corp., Wayne L. Dowdey, formerly manager of Eimco's Southern Dist., has been appointed general sales manager for the corporation.

Paul O. Richter, Eimco vice president, has been named general manager of the Filter Div.

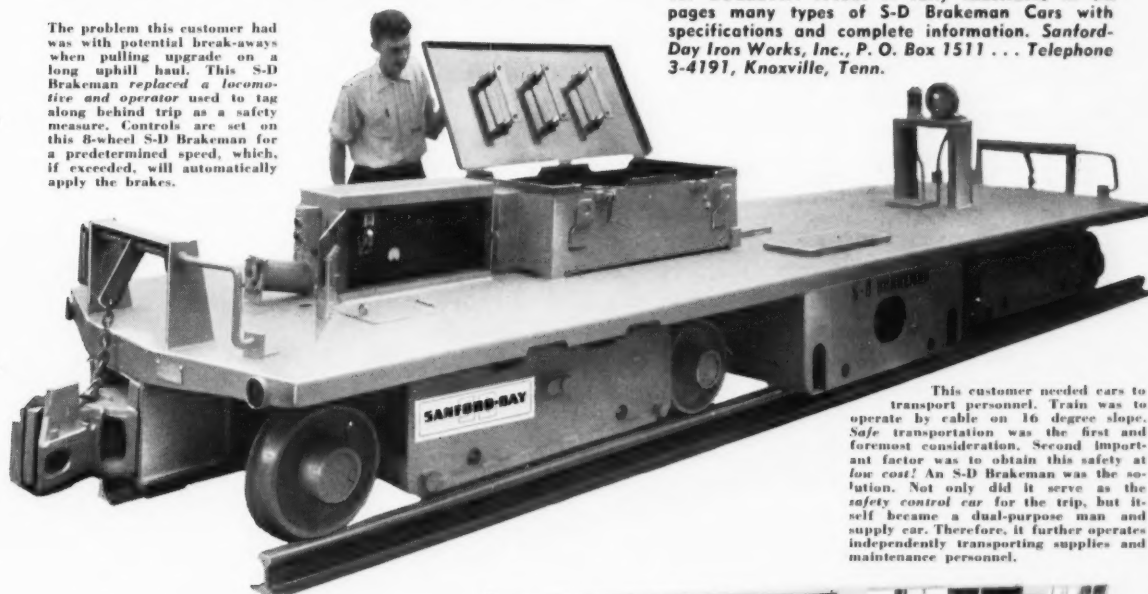
Allis-Chalmers Mfg. Co. has made several new appointments.

R. C. Bown has been named man-

Have an Un-Safe haulage problem? The S-D Brakeman® could be your solution!

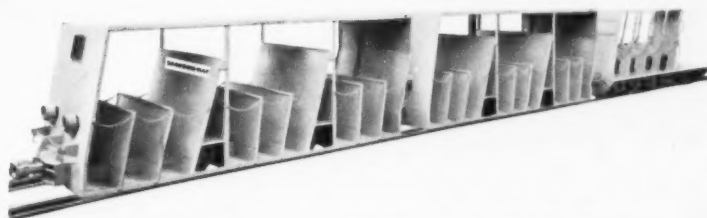
We have developed a special safety car called S-D Brakeman. It incorporates electrically operated magnetic brake shoes. Here are but a few S-D Brakeman and S-D Brakeman Personnel and Supply Trains we have engineered and built to solve particular safety problems. S-D Brakeman safety control cars can be designed for use with mine or railway cars to solve any number of problems at low cost - underground, . . . mainline, . . . tipples, etc. Write us today for BULLETIN A400. It fully illustrates in six pages many types of S-D Brakeman Cars with specifications and complete information. Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tenn.

The problem this customer had was with potential break-aways when pulling upgrade on a long uphill haul. This S-D Brakeman replaced a locomotive and operator used to tag along behind trip as a safety measure. Controls are set on this 8-wheel S-D Brakeman for a predetermined speed, which, if exceeded, will automatically apply the brakes.

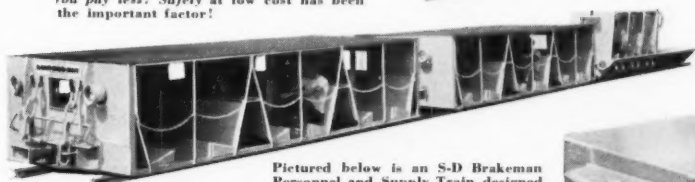


This customer needed cars to transport personnel. Train was to operate by cable on 16 degree slope. Safe transportation was the first and foremost consideration. Second important factor was to obtain this safety at low cost! An S-D Brakeman was the solution. Not only did it serve as the safety control car for the trip, but it itself became a dual-purpose man and supply car. Therefore, it further operates independently transporting supplies and maintenance personnel.

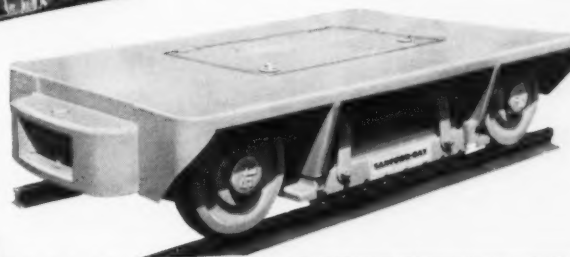
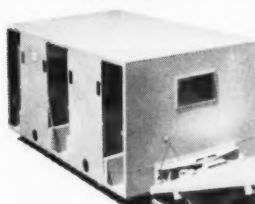
Another customer needed an S-D Brakeman Personnel and Supply Train. In his case, however, underground haulage required low-height train. The two S-D Man Cars are uncoupled from S-D Brakeman at bottom of slope and coupled to conventional locomotive which transports men to working areas. You will note neither design has costly streamlined construction. They are compact all-steel functional units with each steel member an integral part of the frame work. Result: Minimum manufacturing cost which means you pay less! Safety at low cost has been the important factor!



Below is another type S-D Brakeman frequently ordered to replace locomotive used in trips for braking.



Pictured below is an S-D Brakeman Personnel and Supply Train designed and built to operate on 17 degree slope by hoist-cable. Note S-D Brakeman was built with material-handling platform to be level when transporting supplies on the sloping haulage-way. At a pre-determined setting the revolution of the wheel applies the brake shoes.



SANFORD-DAY
KNOXVILLE, TENNESSEE

To: Sanford-Day, 612 Dale Avenue, Knoxville, Tenn.

Gentlemen, please send by return mail CAR BULLETIN A400 with specifications, data and fully illustrating S-D Brakeman Cars

NAME

FIRM

ADDRESS

CITY STATE

Here's a totally new truck: **DODGE CAB-FORWARD**

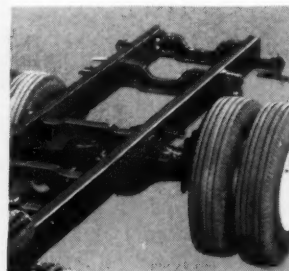
If coal's your cargo, Dodge is your truck. The all-new Dodge Cab-Forward Model.

It's a *compact* truck, only 89¾" from bumper to back of cab. A *strong* truck, with G.V.W.'s to 53,000 lbs. A *powerful* truck, offering your choice of four thrifty Cummins diesels from 464- to 743-cu. in. displacement, and a whole new line of gas V-8's with up to 228 hp. A *comfortable* truck, with suspended-type Bostrom seats available in all models. An *easy-to-service* truck, thanks to new Servi-Swing fenders. And it's a *dependable* truck!

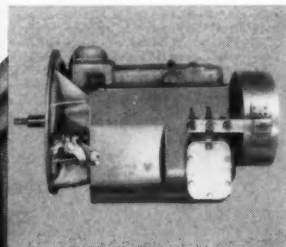
Your Dodge dealer sells it, in models that range from 15,000 lbs. G.V.W. to 76,800 lbs. G.C.W. See the new Dodge Cab-Forward soon. Drive it. Price it. You'll agree it's totally new . . . and right for you!



NEW SERVI-SWING FENDERS open wide at the pull of a latch for easy access to the engine and its components. Reduces down-time.



NEW HEAT-TREATED FRAMES of chrome-manganese steel on heavy-duty models are super-strong yet light in weight for bonus payloads.



NEW TRANSMISSIONS include burly 8- and 10-speed Fuller models, new heavy-duty 5-speed units plus 3- and 4-speed auxiliaries.



A PRODUCT OF CHRYSLER CORPORATION

DEPEND ON
DODGE
TO SAVE YOU
MONEY IN
TRUCKS

40 INSTALLATIONS in 15 COUNTRIES

THE DUTCH STATE MINES HEAVY MEDIUM CYCLONE WASHER

Available in the United States exclusively from

ROBERTS & SCHAEFER



Cleans Fine Coal Cleaner Than Any Other Cleaning System

With a Dutch State Mines Heavy Medium Cyclone Washing System, you get, from Roberts & Schaefer, these exclusive benefits: The technical knowledge of Dutch State Mines engineers, their experience with successfully operating plants in many countries, and the continuing collaboration of their technical organization with the R & S staff on installations in the United States.

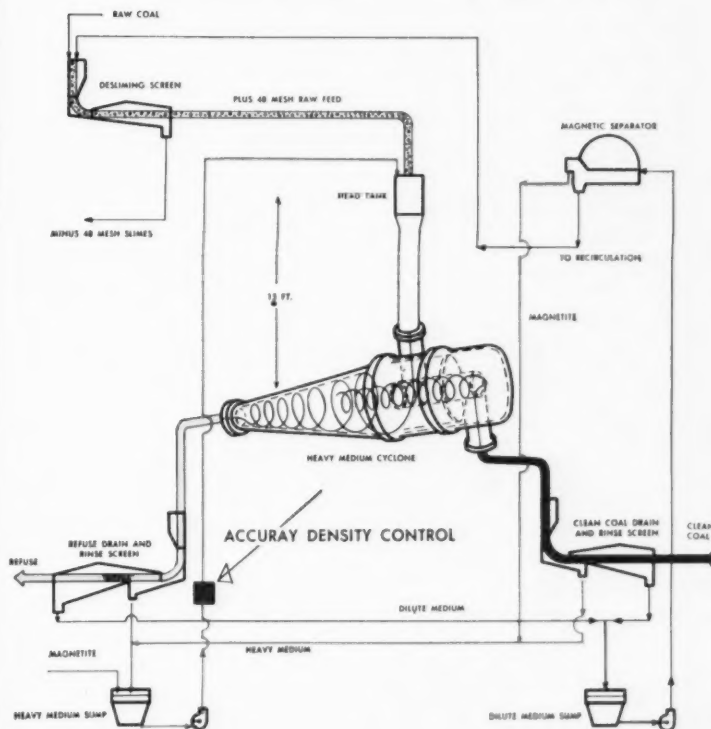
In its own full-scale pilot plant, Roberts & Schaefer has tested many American coals and proved the consistently superior efficiency of the system.

The first commercial Heavy Medium Cyclone Washing Plant in this country, engineered and built by Roberts & Schaefer, is now in operation and others will come on stream in coming weeks.

Roberts & Schaefer takes full responsibility with its own technical staff for engineering, installation and construction of its Heavy Medium Cyclone Washer Plants.

Installations can be made in your present facilities as well as in a completely new plant. Call or write us for detailed information.

FLOW DIAGRAM OF HEAVY MEDIUM CYCLONE WASHING SYSTEM



"AccuRay" is the registered trade mark of INDUSTRIAL NUCLEONICS CORPORATION

- Delivers coal with higher Btu, lower ash.
- Maintains rigid uniformity of quality.
- Obtains maximum recovery of fine coal.
- Washes at any specific gravity you want.
- Holds magnetite consumption to a minimum.
- Operates at highest efficiency regardless of size distribution, particle shape or percentage of near gravity material.
- Produces no measurable degradation of the coal.
- Assures effective specific gravity separation independent of viscosity due to accelerated shearing forces within the cyclone.
- Operates at maximum efficiency through all ranges of capacity.



ENGINEERS & CONTRACTORS
ROBERTS & SCHAEFER
201 NORTH WELLS STREET, CHICAGO 6, ILLINOIS
NEW YORK 19, N. Y. • PITTSBURGH 22, PA. • HUNTINGTON 10, W. VA. • ST. PAUL 1, MINN.

DIVISION OF THOMPSON-STARRETT COMPANY, INC.



**A STAR OF A SCREEN...
AND IT DRAINS
LIKE A DREAM!**

Hendrick Wedge Slot is made with small openings to assure fine screening . . . the kind that keeps coal quality high. Yet, the special Wedge Slot construction affords far greater draining and screening capacity than with any other screen.

Here's another big plus: Wedge Slot's profile bars are "precision shaped" to maintain uniform width of slot openings the entire length of the screen as wear progresses.

To find out more about these special features of Hendrick Wedge Slot, write today. We'll be glad to provide details about the Wedge Slot Screen that's best suited to provide long life under your specific operating conditions.

H E N D R I C K
MANUFACTURING COMPANY

41 DUNDAFF STREET, CARBONDALE, PA.

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Hendrick Wedge Wire Screens • Architectural Grilles • Milco Open Steel Flooring — Shur-Site Treads • Armorgrids • Hydro Dehazers • Distillation Column Internals

Manufacturers (Continued)

ager, General Products Div., for the Midwest region and F. H. Woodruff has been appointed manager of the Evansville, Ill., district. Also, C. E. Lacy has been named new southeast regional representative to industries using processing machinery and W. D. Reuter will handle that line in the central region.

Karl H. Rathmann has been named product advertising manager for the Construction & Mining Div. of Harnischfeger Corp.



Rathmann

Mr. Rathmann's duties will include creation and production of product promotional material for domestic and export advertising programs. He was at one time associated with Allis-Chalmers Mfg. Co. where he handled export advertising for the Tractor Group. Earlier he was assistant advertising manager of Allis-Chalmers' Engine-Material-Handling Div. Mr. Rathmann makes his home in Milwaukee, Wis.

Columbus McKinnon Chain Corp. has appointed Dale E. Hirschfeld district representative for the recently introduced Ratio-Feeder for shuttle-car-to-belt loading.

Mr. Hirschfeld's headquarters will be in Bluefield, W. Va., and he will be in charge of West Virginia, Virginia, East Kentucky, Alabama and Tennessee.

J. D. Hitch Jr., president of Dorr-Oliver, Inc., has been named chairman of the board, and L. R. Boling, currently executive vice president, succeeds him as president.

Edward C. Brass has been named manager of the Cleveland office of The Okonite Co., wire and cable fabrication subsidiary of Kennecott Copper Corp.

He succeeds F. J. Dahleiden, who retired Nov. 1. The company also appointed W. G. Huber as manager of the Detroit office, succeeding M. A. Bergdahl, who retired Dec. 1.

Parker Hannifin Corp. appointed Sturgis Valve & Fitting Corp. as distributor for Parker industrial tube fittings and tube-working tools, and industrial hose and reusable Hoze-lok fittings. Sturgis is located in St. Louis, Mo.

Walter J. Krstich has been named sales engineer for Denver Equipment Co. He will cover the Western Sales Div., covering 11 western states, with headquarters in Denver, Colo.



THE TOP OF ITS CLASS

T-16 OPTICAL TRANSIT

In any comparison of optical and mechanical precision, features and versatility, three characteristics of this repeating transit become immediately evident:

The Wild T-16 is faster, more accurate, and much easier to work with than any other instrument in its price class.

This is the consensus of engineers and surveyors in mining, highway and land surveying functions throughout the world.

Your own evaluation, cordially invited, will quickly prove these facts. Write for the WILD Bulletin T-16.



Full Factory
Services

INSTRUMENTS, INC.

MAIN AT COVERT STREET, PORT WASHINGTON, NEW YORK • PORT WASHINGTON 7-4843

NEW



Austin AP-20D plug type cutter bit

Austin *Snap-Fit* Cutter Bits boost production... slash down-time

Austin series 20 cutter bits snap instantly into place . . . provide a virtually vibration-free cutting edge . . . are easily snapped out and replaced in minutes instead of hours.

Because series 20 bits are precision manufactured, they penetrate faster and provide peak cutting performance far longer than regular tools. 100% machined shanks are held so firmly in blocks that vibration is virtually eliminated. Positive bit and pin seats further assure tight, wobble-free fit.

Austin bits also greatly prolong block and chain life. Due to their precision manufacture, they produce the same length cutting edge from every block. Thus, each bit does an equal share of work and uneven wear is prevented.

For more of the series 20 cutter bit story, call your Austin representative today.

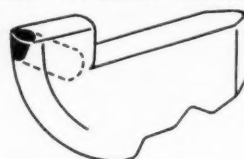
A-1239A



AUSTIN
POWDER COMPANY
CLEVELAND 13, OHIO

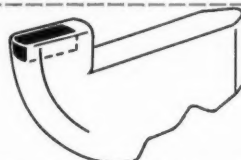
3 precision-machined models for
longer life . . . faster bit changes

AP-20D



Entire surface of carbide insert with exception of cutting edge is brazed to shank.

AP-20



Three sides and extreme end of carbide insert in end mill type bit are brazed to shank.

AP-20R



Carbide insert of full radius bit is brazed in special alloy steel shank for strongest possible support.

Bellaire, O. • Brookville, Pa. • Chapmanville, W. Va. • Charleston, W. Va. • Coaldale, W. Va. • Evansville, Ind. • Grundy, Va. • Hazard, Ky. • Madisonville, Ky. • Masontown, W. Va. • Matewan, W. Va. • Mt. Hope, W. Va. • Waynesburg, Pa.



14 Yard Bites – 160 Foot Boom

This Illinois coal mine counts on two Marion 7400 Walking Draglines to uncover two parallel seams at a rate that keeps the Marions busy around the clock. Truly matched buckets and booms, adequate power for consistently fast cycle time and ability to work and travel almost anywhere help Marion Walkers produce big yardage at low unit costs. Marion Walkers are available in boom lengths up to 300 feet and bucket capacities up to 45 yards. Why not let a Marion mining specialist project Marion Walking Dragline unit costs for your property?

CONSULT



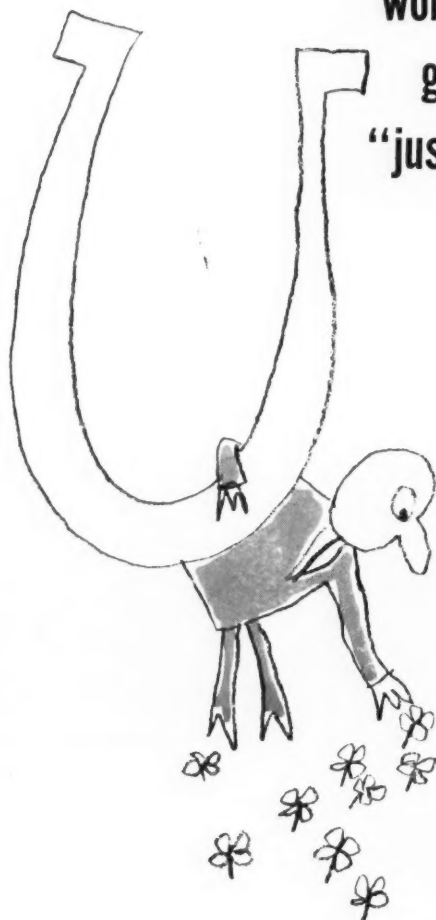
MINING SPECIALISTS

for lowest costs on your property!

MARION POWER SHOVEL COMPANY • Marion, Ohio, U.S.A.

A Division of Universal Marion Corporation

How hard
do you have to
work to make
good luck
“just happen”?



Parm Pritchard was just promoted. New production boss. With it goes a fine, fat raise.

Back home, Mrs. Pritchard and the kids are making plans. Going to get that new station wagon. And the long-promised camping trip. And maybe . . .

“I just got the breaks,” Parm says. Don’t you believe it! He worked at it. And it started the day he discovered a McGraw-Hill publication made precisely to his order. All about *his* job, *his* interests, *his* future.

He read it avidly. And when he wanted to, where he wanted to. Ate it up! Why, this was meat and potatoes stuff he could put to profit for himself and his company, right on the job.

Parm had his eye on management. Management had its eye on him. It wanted him to succeed just as much as he did, himself. And when a man’s interests, and a company’s interests come this close together, something good is bound to happen. And did!

As a reader of this specialized McGraw-Hill publication, like Parm, we urge you to tap its resources deeply. And, after you’ve really dog-eared this issue . . . please pass it on to the man you’d like to have get your job, when you’re promoted. Open it to this page. Let him in on the secret . . .

Men who read more . . . earn more!

PROFESSIONAL SERVICES

ALLEN & GARCIA COMPANY

49 Years' Service to the
Coal and Salt Industries and Consultants
Construction Engineers and Managers
Authoritative Reports and Appraisals
332 S. Michigan Ave., Chicago
120 Wall Street, New York City

AMERICAN AIR SURVEYS, INC.

TOPOGRAPHIC MAPS FOR MINING
AERIAL PHOTOGRAPHS
907 Penn. Ave., Pittsburgh 22, Pa.
A NATIONWIDE SERVICE

GEO. S. BATON & COMPANY

"Founded 1900"
Consulting Engineers
Cost Analysis — Valuations
Mine and Preparation Plant Designs
1100 Union Trust Building Pittsburgh 10, Pa.

C. Ed BERRY

Coal Preparation Engineer
SPECIALIZING
OIL TREATING—FREEZE PROTECTION
BULK DENSITY & HANDLING
702 Benoni Ave., Fairmont, W. Va. • Ph. 4592

EAVENSON, AUCHMUTY & GREENWALD

Mining Engineers
COAL OPERATION CONSULTANTS
VALUATIONS
2720 Koppers Bldg. Pittsburgh 19, Pa.

THERON G. GEROW

Mining Consultant and Engineer

3033 Excelsior Blvd. Minneapolis 16, Minnesota

HOFFMAN BROS. DRILLING CO.

Drill Contractors Since 1902

Specialists in exploratory—grout hole and pressure
groutings. Rigs located in over 50 strategic areas for
prompt service. Free estimates.
104 Cedar St. PUNXSUTAWNEY, Penna.

KIRK & COWIN, INC.

Ralph E. Kirk Percy G. Cowin
Registered Professional Engineers
Consulting—Reports—Appraisals
Mechanical Mining of Ore & Coal
Management and Construction of Mines
1—18th St., SW—Birmingham, Ala.
Phone St. 6-5566

MOTT CORE DRILLING CO.

Contractors

Exploration of Coal Properties. Guarantee satisfactory
coal cores. Inside Mine Drilling. Pregrouting. Mine
Shafts. Large diameter holes.
Huntington 17, W. Va.

DAVIS READ

Consulting Engineer

Layout — Operation
Modern Production Methods
Plant Design — Preparation
120 S. La Salle St. Chicago 3, Ill.

ROBINSON & ROBINSON

Consulting Engineers

Mine Operation—Preparation
Coal Property Valuation
Industrial Engineering
Union Bldg. Charleston, W. Va.

HERBERT S. LITTLEWOOD

Consulting Electrical Engineer

Evergreen Hills Irwin, R.D. #3, Penna.

PAUL WEIR COMPANY

Established 1936

Mining Engineers & Geologists

DESIGN AND CONSTRUCTION
INDUSTRIAL ENGINEERING
20 North Wacker Drive Chicago 6, Illinois

J. B. MORROW

Coal Consultant

Oliver Building Pittsburgh, Pa.

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mines Systems and Designs
Foreign and Domestic Mining Reports
Oliver Building—Mellon Square, Pittsburgh, Penna.

CLASSIFIED

SEARCHLIGHT SECTION

ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

EXPLOSIVES SALES

Excellent opportunity for young graduate engineer with explosives or mining experience to join the Industrial Chemicals Division of Spencer Chemical Company. The person selected will sell and promote the sale of prilled ammonium nitrate for its use as a blasting agent. This is a permanent position offering considerable opportunity to advance with an expanding organization.

In reply, please send resume of experience, education, age and salary requirements to:

Personnel Manager
Spencer Chemical Company
610 Dwight Building
Kansas City, Missouri

ADDRESS BOX NO. REPLIES TO: Box No.
Classified Adv. Div. of this publication.
Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITION VACANT

Mining or Civil Engineer, Graduate student or young engineer with aptitude and desire for development in layout and design work. Attractive opportunity in Midwest Coal Field. P-3142, Coal Age.

BUSINESS OPPORTUNITY

STRIP/COAL WANTED

Lease or purchase—large or small tracts. Morgan Coal Company, 2850 North Meridian Street, Indianapolis 8, Indiana.

Wanted some one to finance a 5-yd stripping shovel to strip coal in Alabama. Will pay 8% interest or will accept partner who is able to furnish a 5-yd shovel and small cash capital to start operation. I have approximately (1) million dollars worth of coal under lease that is very high quality and is growing in demand and there is available several million dollars worth of this same coal nearby. Come and see or correspond by mail Louis B. Moody, Manager, Moody Coal Co., Route #3, Blountsville, Alabama.

FOR SALE

Permissible DC motors and controls out of 2 year old 11BU converted to AC.
150 KW Westinghouse MG set 2400/275
Mr. Llewellyn
Mid-Continent Coal and Coke Company
Carbondale, Colorado

FOR SALE

1 model 621 Page walking dragline machine presently working and in good operating condition. Available with either a 150' boom and 5 yard Page AUTOMATIC dragline bucket or a 135' boom and a 6 yard Page AUTOMATIC dragline bucket. This machine can be delivered immediately. Phone Portsmouth 7-9300, Chicago, Illinois.

DISMANTLING

COKE & BY PRODUCTS PLANT
J & L STEEL CORP.—CLEVELAND, O.

4 Coal Crushers
1200'—30" & 36" Belt Conveyors
4 Bucket Elevators
Cast & Steel Pipe 2" to 18"

HARRIS WRECKING CO.

1963 W. 3rd CH. 1-1907
Cleveland 13, Ohio

At Your Service . . .

The Searchlight Section is at your service to bring business needs or "opportunities" to the attention of men in executive, management, sales and responsible technical, engineering and operating capacities with the industry served by this publication.

ELECTRIC AND MACHINE SUPPLY COMPANY

Largest Supplier of the Best Rebuilt Mining Equipment

JOY TRACKLESS EQUIPMENT

- 1-1-31CM-2CFM-S-1 Joy Continuous Miner
- 1-11RU Joy Cutting Machine
- 1-40E-10 Joy Shuttle Cars
- 1-68C-3GE Joy Shuttle Cars
- 6-58C Joy Shuttle Cars with elevators.
- 6-32E Joy Shuttle Cars
- 6-32D Joy Shuttle Cars
- 3-11BU Joy Loaders, 250 Volt D.C.
- 3-14BU-3PE Joy Loaders
- 1-14BU-7BE Joy Loader, Rebuilt
- 6-14BU-2E Joy Loaders, 28" O.H.
- 4-12BU-9E & 7E Joy Loaders
- 4-8BU Joy Loaders, A.C. & D.C.
- 2-20 BU 1-3E Joy Loaders
- 2-12-3AE Joy Machine Trucks
- 2-12-2E Joy Machine Trucks
- 2-14G Joy Machine Trucks, 220V., A.C.
- 4-12-2E & 2PE Joy Machine Trucks
- 7-PL11-7PE & 8PE Joy Elevators
- 1-WK-83 Joy Compressor, 240 cu. ft., Rubber Mounted, Self-propelled
- 1-WL-82 Sullivan Compressor, 125 cu. ft., Rubber Mounted, Self-propelled
- 1-C025, Joy Coal Drill, Perfect
- 1-T12Joy Supply Jaws (Battery)
- 1-Lot Joy Motors and Armatures—9J, 10J, 23J, 24J, 36J, etc.

MISCELLANEOUS TRACKLESS EQUIPMENT

- 1-70URB Jeffrey Cutting Machine
- 1-Long 88 Pig Loaders
- 1-360 Goodman Loader on Rubber
- 2-Myers Whaley #83 Loaders
- 1-Lee Nurse Jr. Continuous Miner
- 1-210 cu. ft. Acme Air Compressor
- 2-125 cu. ft. Acme Air Compressors
- 7-Manson Jeeps w/9J Motors

BELT CONVEYORS

- 1-48" x 963' Link Belt, Belt Conveyor, w/100 h.p. Drive
- 572'-36" 64A or B Jeffrey Belt Conveyor Structure
- 1,080'-36" Model "C" Joy Belt Conveyor Structure
- 3-36" Model "C" Joy Belt Conveyor Drives
- 1-30" Jeffrey 52B Belt Conveyor
- 1-Tandem Drive w/25 h.p.
- 3-30" Goodman 97MC Belt Conveyors
- 1-Tandem Drive w/30 h.p.
- 4-30" x 1,000' Goodman 99-5GT Belt Conveyors
- 1-w/40 h.p. Tandem Drives
- 2-30" Goodman 99-5GT Tandem Belt Conveyor Drives, 40 h.p.
- 2-30" Joy MTB Tandem Belt Conveyor Drives, 25 h.p.
- 1-30" Shop Constructed Belt Conveyor Drive, 15 h.p.
- 288'-30" Barber Greene Be't Conveyor Structure
- 1-26" Jeffrey 52B Belt Conveyor, 800' centers
- 1-26" Jeffrey 52B Tandem Belt Conveyor Drive, 25 h.p.
- 1-26" x 10,000' Joy Model "C" Overland Belt Conveyor, Complete
- 1-26" x 3,288' Joy MTB Belt Conveyor w/25 h.p. Tandem Drive
- 8,808'-26" Joy Model "C" Belt Conveyor Structure
- 18-26" Belt Conveyor Drives of various types
- 22-Tipple Belt Conveyors, various widths and lengths

CHAIN & SHAKER CONVEYORS

- 3-20" Joy Chain Conveyors, Permissible
- 4-15" Joy Chain Conveyors, Permissible
- 8-15" Long Chain Conveyors, 350' centers w/400 DBH Long Mobile Head
- 1-15" Barber Greene Portable Chain Conveyor for unloading railroad cars
- 22-12" & 15" Jeffrey Chain Conveyors 6IEW, 6IMG, 6IW and 6IAM
- 1-12" Goodman 90L Chain Conveyor
- 2-PT12 Long Piggyback Conveyors

- 2-PT15 Long Piggyback Conveyors
- 2-PT15-B Long Piggybacks, 5 h.p. motors
- 62-Goodman Power Duckbills and Duckbill Hoists, Model 477G
- 60-Goodman G12¹/₂, G15 and G20 Drives
- 7-Joy Ladel UN 17 Shaker Drives

SUB STATIONS & TRANSFORMERS

- 1-500KW G. E. MG Set
- 4-300KW MG Sets
- 5-200KW MG Sets
- 3-150KW G. E. Rotary Converters w/Transformers
- 1-150KW West. Rotary Converter, Completely Automatic
- 15-150KW MG Sets of various makes and voltages
- 1-100KW Motor Generator Set
- 1-100KVA Gasoline alternator Unit
- 2-50KW MG Sets, 125 V., D. C., 1200 rpm
- 2-Armatures for 150 and 200KW Rotary
- 2-600 & 800 Auto Transformers
- 180-Transformers from 3KVA to 500 KVA

CUTTING MACHINES

- 1-70URB Jeffrey Cutting Machine, 250 V. D.C.
- 1-11RU Joy Cutting Machine w/ Bugduster
- 2-29B Jeffrey Cutting Machines
- 1-29C Jeffrey Cutting Machine
- 1-824 Goodman Slabber
- 6-7AU Sullivans
- 3-7B Sullivans
- 16-11B Sullivans, 35 & 50 h.p., 250 V.
- 1-12AB & 12AA Standard Goodmans, 250 V.
- 3-112AA Universal Goodmans, 250 V.
- 9-212AA Baby Goodmans, 250 Volt
- 9-512 Goodman Cutting Machines, with Bugdusters hydraulic.
- 2-512 Goodman Cutting Machines, 220 V. A.C.
- 1-712 Goodman Cutting Machine, 250 V., D.C.
- 1-29U Jeffrey, 220 440 Volt, A.C. Rebuilt
- 2-35L Jeffrey Cutting Machines
- 49-35B and 35BB Jeffreys, A.C. & D.C. Bugdusters and Trucks available

LOCOMOTIVES

- 2-20 Ton MH77 Jeffreys, 42" t.g.
- 1-15 Ton MH826 G.E. Locomotive, 90 h.p. units, 44" O.H., 48" t.g., Excellent
- 1-14 Ton MH110 Jeffrey Locomotive, 42" track gauge
- 7-13 Ton Locomotives, 250 V., any gauge
- 1-12 Ton 29B Goodman Locomotive, 40" O.H.
- 8-10 Ton Locomotives, 250 Volt, any gauge
- 14-8 Ton Locomotives, 250 Volt, any gauge
- 6-7 Ton Atlas Battery Locomotives
- 1-6 Ton Battery Locomotive—New
- 30-6 Ton Locomotives, any gauge
- 3-6 Ton Jeffrey, MH150 Locomotives
- 14-6 Ton MH88 Jeffrey Locomotives
- 10-5 Ton Locomotives, 250 Volt
- 13-4 Ton Locomotives, 250 V., any gauge
- 14 Ton G.E. Battery Locomotives
- 2-4 Ton Mancha Battery Locomotives
- 1-4 Ton 828 G.E. Battery Locomotive Spare Armatures and Trucks for most of above Locomotives

TIPPLE EQUIPMENT

- 1-4 Cell Jeffrey Baum Jig Washer complete
- 1-CMI Coal Dryer, 48". Excellent
- 1-Heat Dryer, Complete
- 1-36"x36" Jeffrey Single Roll Crusher
- 1-36"x33" Marion Double Roll Primary Crusher
- 1-24" x 50" Pa. Single Roll Crusher
- 1-30" x 30" Link Belt Double Roll Crusher
- 2-24" x 24" Jeffrey Single Roll Crushers
- 1-18" x 12" Jeffrey Swing Hammer Pulverizer
- 1-No. 4 Needle Point Breaker, Top opening 48"
- 1-4' x 12" Double Deck Vibrator
- 1-3' x 8" Low Head Vibrator
- 5-Jeffrey Traylor Vibrator Feeders
- 4-Jeffrey Traylor Vibrator Screens
- 1-Magnetic Separator, Complete
- 1-Set Jeffrey Dewatering Screens

- 5-Scraper Conveyors of various sizes
- Air Valves, Blowers, Pumps, New Screens, Parts for CMI Dryers, Speed Reducers, Feeders, practically Jeffrey Baum Jig in parts and many other parts for Tipple

MINE CARS

- 84-35" t.g. Drop Bottom Cars
- 161-42" t.g. End Dump Cars, various makes
- 260-42" t.g. S.D. Drop Bottom Mine Cars
- 1-Phillip Carrier
- 53-42" t.g. ACF Drop Bottom Cars
- 22-44" t.g. Drop Bottom Cars, 10 Ton
- 133-44" t.g. Drop Bottom Cars, various sizes
- 273-44" t.g. End Dump Cars, various sizes
- 250-48" t.g. S.D. Drop Bottom Cars, 22" O.H.
- 2-56¹/₂" t.g., 3 Ton, 4 Wheel Push Trucks New

RAIL AND WIRE

- 463—Tons, 30, 40, 56, 60, 65, 70, 80 & 90 lb. Relaying Rail
- 1,663'-1,000,000 CM Feeder Cable, Insulated
- 3,088'-750,000 CM Insulated Copper Feeder Wire
- 3,197'-750,000 CM Bare Copper Feeder Wire
- 499'-350,000 CM Insulated Copper Feeder Wire
- 681'-300,000 CM Insulated Copper Feeder Wire
- 500'-4.0 Stranded Insulated Copper
- 17,757'-4.0 Trolley Wire
- 3,374'-6.0 Trolley Wire
- 1,250'-9 Section Trolley Wire
- 70,444'-4.0 Stranded Highline Wire
- 17,031'-2.0 Stranded Highline Wire
- 76,800'-1.0 Solid Copper Trans. Line
- 42,926'-2.2 Stranded Transmission Wire
- 9,333'-6.0 Solid Copper Transmission Wire
- 3,880'-4.0 3 Cond. Neoprene Covered Cable
- 550'-2.0 3 Cond. Anhydrex & Lead Covered Cable

MISCELLANEOUS

- 1-Schrader Hyd. Coal Drill
- 1-Canton Track Cleaner—Excellent
- 1-H.K.L. Brown Fayre Car Spotter
- 1-CH Sullivan 5 h.p. Car Spotters
- 102-Coal Drills, 571CP, 572CP, 573CP, 473CP, A6 and A7 Jeffrey
- 1-WK29 Sullivan Air Compressor, 120 cu. ft. capacity, 48" t.g.
- 2-Cantrell Compressors, 120 cu. ft. capacity, 48" t.g.
- 22-Air Compressors of various sizes
- 1,270-Edison Lamps, Model P and R4
- 57-Auto Starters from 3 h.p. to 100 h.p.
- 1-HKG Browne Layer Loader Hoist
- 90-Hoists from 5 h.p. to 800 h.p.
- 6-Shop Constructed Jeeps, Track mounted
- 664-Stationary Motors—1/2 to 800 h.p. of various specifications
- 1-Prefab Building, 14'8" x 16'
- 124-Pumps from 3/4 to 4500 GPM of various specifications
- 1-10 h.p. Deming Deep Well Pump
- 1-330 GPM, 6" Pomona Deep Well Pump
- 1-14" Centrifugal Slurry Pump, w/15 h.p. Motor
- 3,060'-3/4" Galvanized Pipe
- 283'-2" Plastic Pipe
- 25,605'-2" Black Pipe
- 800'-3" Black Pipe
- 2,500'-4" Black Pipe
- 500'-6" Black Pipe
- 1-Rubber Vulcanizer, type 2
- 47-Room Blowers, Brown Fayre & Jeffrey
- 40-Mine Fans from 30" to 6' H1 Pressure
- 15-Battery Chargers, various voltages
- 6-Cleveland Stoppers
- 15-Scales for Mine Trucks
- 9-Rock Dusters up to 30 h.p., track and rubber mounted
- 1-Dust Collector for Roof Bolting
- 22-18" x 24" I Beams
- Several hundred feet #2 and #3, 2 conductor Machine Cable
- SHOP MACHINERY: Lathes, Drills, Grinders, Welders, Shapers, Presses, Milling Machines

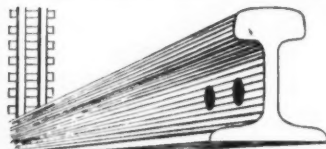
We have thousands of dollars worth of parts for the equipment listed.
ALL INQUIRIES WILL BE ANSWERED PROMPTLY—Call, Wire or Write us, day or night
PHONE EITHER OF OUR LOCATIONS FOR FAST RELIABLE SERVICE

ELECTRIC AND MACHINE SUPPLY COMPANY

WHITESBURG, KENTUCKY
BOX #610, Ph. #2223
NIGHT PHONES 2234 or 2347

CLARKSBURG, WEST VA.
BOX #227, Ph. #MA 3-0253
NIGHT PHONES VI 2-2776 or MA 2-6338

BILL CONLEY • MELVIN ADAMS • LEONARD NEASE • JACK FAIRCHILD • HANK UBBING • GORDON STAFFORD



RELAYING • NEW RAILS
TRACK MATERIALS

MIDWEST STEEL CORP.
612 DRYDEN STREET
CHARLESTON 21, W. VA.

9 G.E. DIESEL LOCOMOTIVES
23, 25, 45, 65, 80, & 100 Ton

3-10 H.P. CAR PULLERS
Link Belt 220/440 volt

JEFFREY COAL CRUSHERS
3-24 x 24, 24 x 30, & 30 x 30

R. C. STANHOPE, INC.
60 East 42nd St., N. Y. 17, N. Y.

LOCOMOTIVES

THE IRONTON ENGINE COMPANY
STORAGE BATTERY — TROLLEY
FARMINGDALE, NEW JERSEY
(Formerly Ironton, Ohio, 1902-1950)

MINING HOISTS

DOUBLE AND SINGLE DRUM
SHAFT AND INCLINE HOISTS

Please send us your inquiries
LEO A. HARDING

1625 Nay Aug Ave., Scranton 9, Pa.
Phone: Diamond 4-3126 or 2-2913



MOTORS • GENERATORS
TRANSFORMERS
NEW • REBUILT

ELECTRIC EQUIPMENT CO.

WORLD'S LARGEST INVENTORY
CALL COLLECT GL 3-4783
P. O. BOX 51 • ROCHESTER 1, N. Y.

TO LOWER YOUR MINING COSTS

Check our listing of modern mechanical equipment — whether to completely mechanize or further mechanize your operation — we offer the most complete stock of used and rebuilt machinery.

BUY — SELL — TRADE

IF WE ADVERTISE IT — WE OWN IT

A.C. MINING EQUIPMENT FOR SALE

- 1-50 H. P. Goodman Standard, 220 Volt A.C., Cutting Machines
- 3-118U-10APH Joy Loading Machines, 220/440 Volts A.C.
- 1-88U-11G Joy Loading Machines, 220 Volts A.C. (can be changed to 440 Volts A.C.)
- 2-4JCM Joy Continuous Miners, 440 Volts A.C.
- 1-10RU Joy Cutting Machine, 220/440 Volts A.C.
- 3-512 Goodman Cutting Machines, 220/440 Volts A.C.
- 3-78 Sullivan Cutting Machines, 220/440 Volts A.C.
- 1-98U Joy Loading Machine, 220 Volt AC, 31" high, equipped with stub boom for PT-12 Piggyback

LOADING MACHINES FOR SALE

- 1-18 HR Joy Loading Machine, 250 Volts D.C.
- 4-11 BU-10APE Joy Loading Machines, 250 Volts D.C.
- 1-11 BU-11APE Joy Loading Machine, 250 Volts D.C.
- 4-14 BU-7BE Joy Loading Machines, 250 Volts D.C.
- 2-14 BU-3PE Joy Loading Machines, 250 Volts D.C.
- 6-12 BU-9E Joy Loading Machines, 250 Volts D.C.
- 3-8 BU Joy Loading Machines, 250 Volts D.C.
- 3-7 BU Joy Loading Machines, 250 Volts D.C.
- 1-66S Goodman Loading Mach. 250 Volts D.C.
- 2-Long 12" Piggyback Conveyors, each 300' long, complete with PT-12 Piggybacks and 178U Joy Loading Machines.
- 1-118U-14E Joy Loading Machine, 250 Volt DC, 75 H.P. Main Motor, Serial No. 5803.

SHUTTLE CARS FOR SALE

- 2-105C-1E Joy Shuttle Cars, 250 Volt DC, completely modern.
- 1-570-48 Goodman Shuttle Cars, 250 Volts, D.C.
- 4-55C Joy Shuttle Cars, Matched Pair, Elevating Discharge, Disc Brakes, 250 Volts D.C.—Modern.
- 2-65C-7E Joy Shuttle Cars, Matched Pair.
- 2-65C-5E Joy Shuttle Cars, Elevating Discharge, 4-Wheel Steering, 250 Volts D.C.
- 3-42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C. 2-Standard, 1-Opposite Standard Drive.
- 1-Jeffrey Shuttle Car, 4-Wheel Drive and Steer.
- 1-32E16 Joy Shuttle Cars, Disc Brakes & Elevating Discharge.
- 1-42E15A Joy Shuttle Car.
- 1-32 E-7 Joy Shuttle Car.

CUTTING MACHINES FOR SALE

- 1-512 CJ Goodman Cutting Machine, 50 H.P. with bugduster.
- 1-11RU Joy Cutting Machine, 250 Volts D.C. with 9' Cincinnati Bar, Chain and bugduster.
- 1-10RU Joy Cutting Machine, 250 Volt D.C. with bugduster.
- 2-29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
- 1-512 CCH Goodman Cutting Machine, 250 Volts D.C.
- 5-35B Jeffrey Cutting Machines, 250 Volts D.C.
- 6-35BB Jeffrey Cutting Machines, 250 Volts D.C.
- 1-35 LC Jeffrey Cutting Machine, 35 H.P.

- 2-29LC Jeffrey Cutting Machines, 250 Volt D.C.
- 2-512 EJM Goodman Cutting Machines
- 2-512DA Goodman Cutting Machines, 250 Volts D.C.
- 2-7AU Sullivan Cutting Machines, 250 Volts D.C.
- 3-212 AB Goodman Machines.
- 2-412 AA Goodman Machines.
- 1-35L Jeffrey Machine 35 H.P.

CONTINUOUS MINERS FOR SALE

- 3-4JCM Joy Continuous Miners, 440 Volts A.C.

RECTIFIERS FOR SALE

- 1-150 KW General Electric Stationary Rectifier, 440 Volts Primary, 275 Volts D.C., Serial No. 6628.
- 1-300 KW Westinghouse Three-Car Portable Rectifier, 7200/13000 Volts, 3 phase, 60 cycle primary and 275 Volts D.C. secondary.

ROTARY CONVERTERS FOR SALE

- 1-150 KW Rotary Converter, Serial No. 1054562, with 150 KVA transformer and panel boards.
- 1-300KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.

COAL DRILLS FOR SALE

- 25-CP-472 Electric Coal Drills, 250 Volts D.C.
- 5-CP-572 Coal Drills.
- 1-CP-RBD Roof Drill, Serial No. A858913.

CRUSHER FOR SALE

- 1-36" x 36" Double Roll McLanahan Stone Crusher, complete with 100 H.P. Motor.
- 1-18" x 30" Double Roll, Doub's Drive, Scottsdale Crusher.
- 1-Cedar Rapids 20" x 30" Swing Hammer Crusher with 40 H.P., 220/440 Volt AC Motor.
- 1-Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.
- 1-Scottdale 20" x 30" Double Roll, Double Drive Crusher.

COMPRESSORS FOR SALE

- 3-Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

- 1-10 Tan Goodman Locomotive, Serial No. 4371—Type 32A04-T, 250 Volt D.C., 42" track gauge. Height 34".
- 1-MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volt D.C., 26 1/2" high, rebuilt.
- 1-MH-88 Jeffrey Locomotive, 30" high with CY-21 Reel, 44" track gauge.

ROCK DUSTERS FOR SALE

- 1-MSA Track Mounted Rock Duster, 10 H.P., A.C. or D.C., high pressure, 30" high, any gauge.
- 2-MSA Bantam Rock Dusters, Rubber Tired, Portable.
- 2-MSA Bantam Rock Dusters, Skid Mounted.
- 1-American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE

- 10-#11 1/2 Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
- 2-Brownie Hoists, Model HK1—Good condition.
- 1-Brownie Hoist, Model HKM—Good condition.

ELEVATORS FOR SALE

- 1-PL11-14 Joy Elevator.
- 2-Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE

- 1-Goodman Low Vain Truck.
- 4-T2-SAPE Joy Trucks, 250 Volts D.C. Permissible.
- 2-T2-SAPE Joy Machine Trucks, 250 Volt D.C., equipped with hydraulic system for drill.

CHAIN CONVEYORS FOR SALE

- 5-61AM Jeffrey Chain Conveyors, 10 H.P. 300' long.
- 3-61MG Jeffrey Chain Conveyors, 5 H.P. 40' long.
- 3-15 H.P. Joy Head and Tails.
- 400 ft. 15" Pans and Chains. (Joy)
- 700 ft. Goodman 30", 97C Structure complete with drive.

DIESEL PLANTS FOR SALE

- 1-60 KW, G.M. Diesel Generator Set, with 60 KW, 250 Volt D.C. Dalco Generator.
- 1-100 KW Waukesha Diesel Generator with 220/440 Volts D.C.
- 1-100 KW Diesel Generator Unit, with G.M. Diesel Engine and 100 KW Generator.
- 1-D13000 Caterpillar Diesel Generator Unit, with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.
- 1-250 KW Diesel Generating Plant, consisting of Westinghouse 250 KW 275 Volt Compound Wound Generator driven by Twin 6110 General Motors Engines. Complete with switchgear and all appurtenances. New in 1956.

MOTOR GENERATORS FOR SALE

- 1-50 KW Westinghouse MG Set, 440 Volt AC, 250 Volt DC.
- 1-300KW Westinghouse Motor Generator Set, synchronous motor, 433 KW Output, 435 KVA, 2200 Volts, 1200 RPM. D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
- 3-50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
- 1-200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amp. I-T-E automatic circuit breaker, 2300 A.C., 275 Volts D.C.

BELT CONVEYORS FOR SALE

- 2 only 1200' 26" Belt Conveyors with 30 H.P. 250 Volt D.C. Drives.

MISCELLANEOUS FOR SALE

- 3-15 H.P. Heads and Tails
- 400 ft.—15" Pans and Chains
- 3-35B Jeffrey Armatures, 250 Volts DC.
- 4-902, 250 Volts D.C. Westinghouse Motor Units, only.
- 1-RSE Jeffrey Reel and Motor, complete.
- 1-PL 11-14 Joy Elevator.
- 10-Goodman 512 Cutter Bars and Chains.
- 210-AC&F 42" Gauge, 48" high Drop Bottom Mine Cars. Condition like new.
- 1-24" Fan with drive.
- 2-7 1/2 H.P. Tricycle Type Rubber Tired Mine Tractors, 7 1/2 H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
- 3-24 J Motors, 7 1/2 H.P., 250 Volt D.C.
- 3-75 KVA Transformers, 2300/4000 Wye to 220 Volts.

ALL EQUIPMENT LISTED AND HUNDREDS OF OTHER ITEMS ARE IN STOCK AND MAY BE INSPECTED

AT OUR SHOP AND EQUIPMENT YARD LOCATED AT RALEIGH, WEST VIRGINIA

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia

Phone CLifford 3-7383

J. J. MAHONEY

WILLIAM R. MONK

R. E. KAMM

Res. Phone CLifford 3-6804, Beckley

Res. Phone CLifford 3-6907, Beckley

Res. Phone 4281, Summersville

YOU CAN'T BUY A REPUTATION

Reputations are earned, not bought. And, in these days when the dependability of the people you do business with is so important, it pays to find out something about their reputations. We'd like you to ask anybody in the Machinery business about J. T. FISH—even our competitors! You can depend on us to BUY or to SELL any quantity of Mining Equipment, from one item to a complete mine, and at fair prices always!

WE BUY—SELL—TRADE

JOY EQUIPMENT—REBUILT

- 1—Joy 14BU Loaders, low pedestal, 7AE.
- 6—Joy 14BU Loaders, medium pedestal, 7RBE.
- 4—Joy 14BU 3PE Loaders.
- 6—12BU10E Joy Loaders complete with Piggy-backs.
- 2—Joy 12BU Loaders, 9E, latest type.
- 1—Joy 20BU Loader, latest type.
- 2—Joy 11BU Loaders, latest type.
- 1—Joy 8BU Loader, 34" overall height.
- 2—Joy 8BU Loaders, 220 V. AC.
- 1—Joy curved Bar Head, complete.
- 6—Reliance 24-J Motors, 7½ H.P.
- 10—Reliance 38-J Motors, 10 H.P.
- 20—9-J Motors, 4 H.P.
- 2—Goodman 660 Loaders on Crawlers 440 V. DC, like new.
- 1—Goodman 660 Loader on Crawlers, excellent 250 V. DC.
- 1—Goodman 665 Loader on Crawlers, latest type 250 V. DC.
- 1—Goodman 865 Loader, 26" hi. Rebuilt. 250 V. DC.
- 4—Joy RSC Shuttle Cars, rebuilt.
- 4—Joy 6SC Shuttle Cars, rebuilt.
- 3—Joy 6SC Shuttle Cars, latest type.
- 1—Joy 5SC Shuttle Car, excellent.
- 2—Joy 32E9 Shuttle Cars.
- 2—Joy 32E10 Shuttle Cars, rebuilt.
- 2—Joy 32E12 Shuttle Cars, rebuilt.
- 4—Joy 32E16 Shuttle Cars, rebuilt.
- 2—Joy 42E16 Shuttle Cars, rebuilt.
- 1—Joy CD-22 Drill, on rubber, like new.
- 6—Joy T-2-5 low pan Crawler Trucks.
- 1—Joy T-2-6 low pan Crawler Truck with reel.
- 2—Joy T-1 Standard Crawler Trucks, 220 AC.
- 1—Joy T-1 Standard Crawler Truck 250 DC.
- 2—Goodman low pan Crawler Trucks, like new, latest type.
- 4—Joy 11-B Cutting Machines, like new, 35 & 50 H.P.
- 1—Joy 7-B Cutting Machine, like new, 250 V. DC.
- 2—Goodman 212 Cutting Machines, 19" high.
- 4—Goodman 312 Cutting Machines, 17" high.
- 3—Goodman 412 Cutting Machines, 19" high.
- 1—Goodman Machine on Crawler, 31" high, All hydraulic.
- 6—Goodman 512 Machines with Bugdusters.
- 6—Goodman 612 cutting machines, 250 and 500 volt.
- 1—Lee Norse low vein Machine Carrier on rubber.
- 1—Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
- 1—Joy 11RU Rubber Tired Cutter with bugdusters, Universal heads, like new, 250 V. DC.
- 2—Joy 10RU rubber tired Cutters, Universal head, 220/440 V. AC. Perfect.
- 6—7AU's on track, Universal head.
- 2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 volt DC.
- 1—Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

- 1—Goodman 6 ton, 91-A, 27" high, armor plate frame.
- 2—Jeffrey, 13 ton, type MH-110, 36", 42" and 44" ga.
- 2—Jeffrey, 10 ton, type MH-110, 42" and 44" ga.
- 2—Jeffrey, 10 ton, type MH-78, 42" and 44" ga.
- 2—Goodman 8-30 and 10-30 Locomotives, 26" above rail.
- 1—Jeffrey MH-124, 6 ton, 24" overall height.
- 12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" ga.
- 4—Jeffrey, 8 ton, type MH-100 2½" armor plate frames.
- 1—Jeffrey, 6 ton, type 2186, 22" above rail.
- 3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" ga.
- 1—G.E., 4 ton, type 825 Locomotive, 22" high.
- 10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.
- 1—G.E., 8 ton, type 822 Locomotive, 44" ga.
- 3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.
- 2—Goodman, type 33, 6 ton, 44" and 48" ga.
- 2—Goodman, type 902, 4 ton, 42" and 48" ga.
- 2—Atlas Battery Locomotives 36" ga.
- 1—Atlas Trolley Locomotive, 4 ton, 24" high.
- 2—Westinghouse, type 904, 6 ton, 44" and 48" ga.
- 2—Westinghouse, type 906, 44" and 48" ga.
- 2—Westinghouse, type 907, 10 ton, 44" and 48" ga.
- 8—Jeffrey MH-78 Locomotive Units, cheap.
- 4—Jeffrey MH-88 Locomotive Units, real bargains.
- 6—Jeffrey MH-100 Locomotive Units, reasonable.
- 3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" ga.

Locomotive Trucks and Spare Armatures for all the above.

TIPPLE EQUIPMENT

- 1—Complete Five Track Tipple with Washers and Air Tables.
- 5—Complete Tipples, 3 to 5 track, steel and wood.
- 3—Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-Fluo Tables.
- 4—Complete Aerial Trams for coal or refuse.
- 3—Complete Rope and Button Lines.
- 2—Monitor Lines complete with Drums, excellent.
- 3—Allis-Chalmers 5' x 12' Low-Head Vibrators.
- 2—Allis-Chalmers 5' x 12' Rippflo Vibrators.
- 1—Allis-Chalmers 4' x 12' Low-Head Vibrator.
- 1—Robins Gyrex Vibrator, 4 x 10.
- 10—Belt and Apron type Loading Booms.
- 6—Shaker Screens.
- 1—Robins Car Shakeout.
- 20—Crushers, various sizes—Gundlach, Jeffrey, McLanahan & McNally.
- 4—Mine Scales, 10 & 20 tons
- 5—Track Scales, 25 to 40 tons, late type.
- Feeders, Belt and Drag Conveyors, Car Retarders, etc.

CUTTING MACHINES

- 2—Joy 10RU rubber tired Cutters, Universal Head, 220/440 volt AC. Perfect
- 1—Joy 11RU, rubber tired Cutter, 250 V. DC.
- 1—Jeffrey 70 URB Cutter, rubber tired, Universal Head, low vein.
- 2—Jeffrey 29UC Universal Machines on Crawlers.
- 1—Goodman on Crawlers, 31" overall height.
- 3—Baby Goodman 212's, rebuilt, 250 V. DC.
- 2—Goodman 212 Cutting Machines, 19" high.
- 4—Goodman 312 Cutting Machines, 17" high.
- 2—Goodman 412 Cutting Machines, 19" high.
- 6—Goodman 512's, with Bugdusters, like new.
- 4—Goodman 512's, rebuilt, or as removed from service.
- 3—Goodman 112's, 220/440 V. AC.
- 1—Joy 7-B Cutting Machine, 250 V. DC.
- 4—Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
- 6—7AU's on track, Universal Head.
- 10—Goodman 12AA's and 112AA's, 250 V. DC.
- 2—Goodman 324 Slabbers.
- 2—Goodman 724 Slabbers.
- 2—Goodman 824 Slabbers.
- 6—Jeffrey 35L's, like new, 17" high.
- 2—Jeffrey 35L's, on low vein trucks.
- 15—Jeffrey 35B's and 35B8's.
- 2—Jeffrey 29B's on track.
- 2—Jeffrey 29C's, track mounted.
- 2—Jeffrey 29L's, on Crawlers. Excellent.
- 3—Sullivan CE7, 220 V. AC.

CONVEYORS

- 2—Robins 36" tandem drives, with or without structure.
- 2—Joy 30" Underground Belt Conveyors, 500' to 2000' each. Excellent.
- 1—Goodman 97-C 30" Conveyor, 1500' long.
- 1—Goodman 97-C 26" Conveyors, 1,000' long.
- 3—Robins 30" Belt Conveyors, 200' to 2000'.
- 4—Jeffrey 52-B, 30" Drive and Tail Assembly, complete.
- 2—Joy MTB 30" Drive and Tail Assembly, complete.
- 3—Goodman 97 HC 30" Drive and Tail Assemblies, complete.
- 4,000 Conveyor Belt, 36".
- 8,000 Conveyor Belt, 30".
- 4,000 Conveyor Belt, 26".
- 8—Jeffrey 61AM 12" Chain Conveyors, 300'.
- 2—61EW Elevating Conveyors.
- 2—61WH 15" Room Conveyors, 300'.
- 2—Joy 15" Room Conveyors, 300'.
- 2—Joy 20" Conveyors, 300'.
- 4—Joy Ladel 10-17 Shakers.
- 10—Goodman G-12½ and G-15 Shakers.
- 3,000' Goodman 18" Flat Belt Conveyors, tandem drive, any length. Perfect.
- 2,500' Goodman 20" Flat Belt Conveyors, tandem drive, any length. Perfect.

CONVERTERS AND DIESEL PLANTS

- 1—300KW Portable Rectifier, 3 car unit, excellent.
- 2—500KW G.E. Stationary Rectifiers.
- 4—1,000KW Stationary Rectifiers.
- 2—100KW, G.E. TCC-6's, 275 V., Rotary Converters.
- 1—150KW, G.E. HCC-6, 275 V., Rotary Converter.
- 1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. DC.
- 2—200KW G.E. HCC-6's, Rotary Converters, 275 V. DC. Newly rewound.
- 3—300KW G.E. HCC-6's, Rotary Converters, 275 V. DC. Like New.
- 2—300KW Westinghouse, 6 phase, Rotary Converters, 275 V. DC.

- 2—500KW Westinghouse Rotary Converters, 275 V. DC.
- 2—200KW Westinghouse Rotary Converters, 275 V. DC. Newly rewound.
- (All the above with 6900/13000 and/or 2300/-4000 primary transformers)
- 2—100KW MG Sets, 275 V. DC.
- 2—150KW MG Sets, G.E. and Westinghouse, 275 V. DC.
- 1—200KW MG Set, Westinghouse, rebuilt, 275 V. DC.
- 1—200KW MG Set, G.E., perfect, 275 V. DC.
- 2—300KW G.E. MG Sets, like new.
- 1—300KW Westinghouse, 600 volt MG Set, rebuilt.
- 2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
- 2—500KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
- 2—500KW HCC-6's, Rotary Converters, 6 phase, 600 V. DC.
- 1—GMC-471 Diesel with 60KW, 250 V. DC Generator.
- 2—GMC-671 Diesel with 75KW, 250 V. DC Generator.
- 1—Cummins 125KW Diesel with 250 V. DC Generator.
- 1—Allis-Chalmers Natural Gas Engine with 100KW Generator, 275 V. DC.
- Boilers, like new, 500 H.P.

LOADING MACHINES

- 3—Joy 12BU9E Loaders, latest type.
- 6—Joy 12BU with Piggyback Conveyors.
- 16—Joy Loaders, 14BU, 12BU, 8BU, 11BU, 20BU.
- 2—Goodman 865 Loaders, 26" on Crawlers.
- 1—Goodman 665 Loader, on Crawlers.
- 2—Goodman 660 Loaders, 440 V. AC, perfect.
- 1—Goodman 660 Loader, on Crawlers.
- 1—Goodman 460, on track, Rebuilt.
- 2—Jeffrey 61 CLR's on rubber, 26".
- 3—Jeffrey L-500 Loaders.
- 2—Myers Whaley, No. 3 Automatic Loaders.
- 2—Clarkson Loaders, 26" above rail.

MISCELLANEOUS

- 1—Complete Five Track Tipple with Washers and Air Tables.
- 5—Complete Tipples, 3 to 5 Track. Wood and Steel.
- Steel Trestles for drop bottom cars.
- All Steel Armo Build ngs.
- 20—Jeffrey Molveyors on rubber tires.
- 1—¾ Yard Shovel and Back-Hoe.
- 1—¾ Yard Crawler Crane.
- Battery Supply Tractors, Rubber tired.
- 1—Cantrell Air Compressor on rubber tires.
- 10—Air Compressors, 1 H.P. to 40 H.P.
- 2—Joy self-propelled rubber tired compressors, 240 cu. ft.
- 2—Acme Self Propelled rubber tired compressors, 130 cu. ft.
- 40—Mine Pumps, all types.
- 1—Differential 40 Passenger Man-Trip Car.
- 6—MSA Rock Dusters.
- 2—Phillips Carriers, 44" and 48" ga.
- 1—Barber-Greene self-propelled Bucket Elevator.
- Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
- 300—Mine Cars, drop bottom, 42" ga.
- 90—Mine Cars, drop bottom, 44" ga.
- 50—Mine Cars, drop bottom, 48" ga.
- 100—Mine Cars, 18" high, end dump, 44" ga.
- 300—Mine Cars, end dump and drop bottom, 20" high, 48" ga.
- 1—10 ton Mine Car Scale with Recorder.
- 15—Brown Fayro HKL and HG Car Spotters.
- 1—Brown Fayro Hydraulic Car Spotter.
- 1—12 ton Differential Slate Lorry.
- Incline Hoists, 25 to 50 H.P.
- 1—Jeffrey 5' Aerodyne Fan, like new.
- 1—Jeffrey 6' Aerodyne Fan.
- 1—Jeffrey 8' Aerodyne Fan.
- 2—Storage Tanks, 4,000 Gallons.
- 2—Storage Tanks, 10,000 Gallons.
- 10,000 Five Gallon G.I. Cans, screw lids.
- 2,500 tons Retaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb.
- 30 Tons Copper—4/0 and 9 Section Trolley 1/0, 2/0, 4/0 Stranded.
- Thousands of feet of rubber covered three conductor cable, All sizes.
- 300—Transformers from 1 to 300 KVA, 110 to 13,000 primary volts.
- 400—Electric Motors, 3 to 250 H.P.
- Huge Stock of Mine Supplies.
- 600—MSA Mine Lamps, Chargers, etc.
- 4—Mine Scales, 10 & 20 ton.
- 5—Truck Scales, 25 to 40 ton, late type.
- Tandem Dump Trucks.

THOUSANDS OF OTHER ITEMS.

WE OWN WHAT WE ADVERTISE

J. T. FISH

LOGAN, WEST VA.

PHONE PL 2-4400



BONDED QUALITY BARGAINS

CURRENT MODELS - IMMEDIATE SHIPMENT FROM OUR FACTORY - WRITE, WIRE OR PHONE FOR FREE CATALOG AND PRICES

BONDED® TROUGHING IDLER CONVEYOR BARGAINS



CONVEYOR PRICES
INCLUDE BELTING

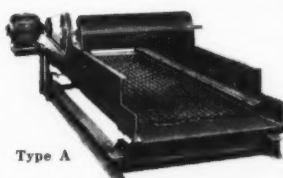
Complete Pre-Fab sections of 8" Jones & Laughlin Jr. I Beam Frame Conveyors quickly and easily joined together on the job. These beams are rolled with .20% Copper Content. Atmospheric exposure tests disclose that Junior Beams, with .20% Copper have as much as four times the resistance to corrosion as non-copper steels. Braced with structural angle, welded to frame for maximum rigidity. Equipped with 5" roll diameter idlers and return rolls, 20" diameter head pulley and 16" diameter tail pulley, mounted on 2 1/4" or 2-7/16" diameter shaft.

We take our loss on our stock of short length belting. You can save as much as 50% on BONDED CONVEYOR SPECIALS, with conveyor belting in two pieces. Belt is new 4-ply, 28 oz. duck 1/32" top rubber cover x 1/32" bottom cover Major grade belt and is Fresh Stock made by leading manufacturers. WRITE FOR BULLETIN #1138.

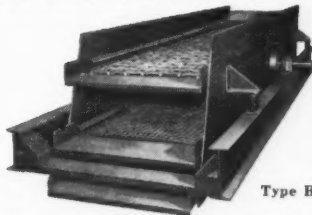
Bonded troughing idler conveyors also available in Truss Frame Construction. WRITE FOR BULLETIN #1189 AND PRICES.

Belt Width	Length of Conveyor	List Price	Sale Price	Add or Deduct Per Ft.
14"	25'	\$1397	\$ 738	
14"	60'	2222	1159	\$16.84
14"	85'	3377	1748	
16"	20'	1262	667	
16"	45'	2137	1118	
16"	60'	2662	1388	18.04
16"	90'	3712	1930	
18"	25'	1477	797	
18"	45'	2217	1182	
18"	70'	3142	1663	
18"	85'	3697	1952	19.24
18"	100'	4252	2240	
18"	130'	5362	2817	
20"	25'	1517	855	
20"	60'	2882	1548	
20"	75'	3467	1854	20.37
20"	90'	4052	2159	
24"	25'	1590	898	
24"	45'	2430	1334	
24"	70'	3480	1878	
24"	100'	4740	2532	21.78
24"	120'	5580	2967	
24"	150'	6840	3621	
30"	50'	2911	1617	
30"	70'	3871	2112	24.75
30"	90'	4831	2607	
36"	25'	1818	1118	
36"	45'	2858	1677	
36"	60'	3638	2096	27.95
36"	100'	5718	3214	

BONDED® GENERAL DUTY AND HEAVY DUTY VIBRATING SCREENS



Type A



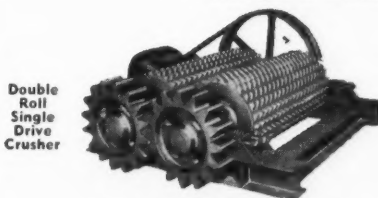
Type B

For mineral, chemical and other industrial products. Fast, efficient and economical for cleaning, sizing, grading, dewatering. Made in all metals, including stainless steel. Enclosed models for hot materials or dust control. Bonded screens are built for any screening operation, wet or dry.

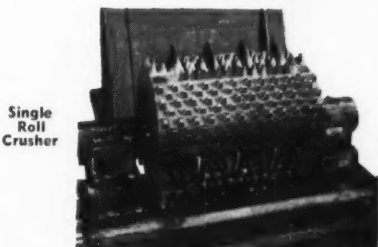
PERFECT BALANCE AND SHARP ACTION. Eccentric weight mechanism, spring mounted. 1 to 3 decks, 2' x 4' to 3' x 8'. WRITE FOR "SEVEN SECRETS OF SUCCESSFUL SCREENING" IN BULLETIN NO. 1086. PRICED FROM \$443

FACTORY BALANCED, CONTROLLED VIBRATION. Four bearing positive throw eccentric shaft: 3' x 6' to 5' x 14'. 1 to 5 decks. WRITE FOR BULLETIN NO. 1087 AND 9 REASONS WHY BONDED IS YOUR BEST BUY. PRICED FROM \$1620.

BONDED® ROLL CRUSHERS



Double Roll Single Drive Crusher



Single Roll Crusher

Bonded Double Roll Crushers are available with single and double drive, in a wide range of roll diameters and face widths. Capacities from small to 500 tons per hour. Will take feed up to 20". Tooth roll models are for primary and secondary crushing of coal, with resultant sizes from stoker size to 8". Teeth are designed to break materials sharp and clean with accurate sizing and a minimum of fines.

All models are available with fine corrugated or smooth rolls or any combination of same for crushing Cinders, Pumice, Perlite, Other Expanded Lightweight Aggregate Chemicals, Limestone Chips, Fertilizer and many other materials.

Bonded Single Roll Crushers give you a wide range of resultant sizes and reduce run-of-mine coal in one operation. Will take feed up to 12".

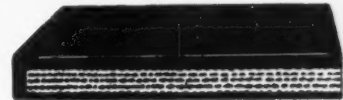
All Bonded Crushers have heavy coil springs that act as an adjusting mechanism as well as a safety device and they are complete with steel hoppers.

Write for Bulletin #1119 describing complete line of Bonded Crushers.

PRICED FROM \$327.00.

TESTED CONVEYOR BELTING*

We pay freight on 200 pounds or over plus an additional 10% savings from sale price for full rolls 500 to 650 feet



Major Brand: 12# to 15# Average Friction Pull, 800# to 1000# Average Cover Tensile.

Heavy Duty 4-ply, 28-oz. duck, 1/4" top rubber cover x 1/32" bottom rubber cover belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stocks.

Width	Ply	List Price	Sale Price
14"	4	\$3.78 ft.	\$2.94 ft.
16"	4	4.24 ft.	3.09 ft.
18"	4	4.69 ft.	3.42 ft.
20"	4	5.17 ft.	3.95 ft.
24"	4	6.08 ft.	4.43 ft.
30"	4	7.47 ft.	5.42 ft.
36"	4	8.85 ft.	6.43 ft.

Major Bee Brand: 16# to 19# Average Friction Pull, 2400# to 3000# Average Cover Tensile. Skim coat between plies.

A high grade of heavy duty 4 and 5-ply, 28 oz. duck, 1/4" top rubber cover x 1/32" bottom rubber cover. These belts are for more severe service, high tonnages and abrasion resistance. For handling stone, mineral ores, concrete, cement, coal and other similar materials, both wet and dry. Belts have molded rubber edges.

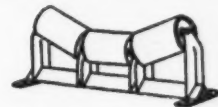
Width	Ply	List Price	Sale Price
14"	4	\$4.48 ft.	\$3.18 ft.
16"	4	5.04 ft.	3.69 ft.
18"	4	5.61 ft.	3.98 ft.
20"	4	6.14 ft.	4.54 ft.
24"	4	7.22 ft.	5.14 ft.
30"	4	8.87 ft.	6.31 ft.
36"	4	10.49 ft.	7.64 ft.
24"	5	8.47 ft.	6.01 ft.

*All belting is tested by the Engineering Laboratory of one of the largest universities in the United States. It is guaranteed to meet or exceed listed specifications.

Other widths plies, duck weights and cover thickness available at low prices.

WRITE FOR FREE SAMPLE & BULL. #1234

BONDED® IDLERS AND RETURN ROLLS SAVE 25% AND MORE



3-roll, 5" diameter Troughing Idlers for:			
14" belt	\$19.75	24" belt	\$22.75
16" belt	20.50	30" belt	23.85
18" belt	21.90	36" belt	24.90
20" belt	22.10	48" belt	27.50

1-roll, 5" diameter Return Rolls for:			
14" belt	\$ 8.50	24" belt	\$11.00
16" belt	9.00	30" belt	12.50
18" belt	9.50	36" belt	13.75
20" belt	10.00	48" belt	16.50

All steel. Interchangeable with other well-known makes. Furnished with replaceable pre-lubricated sealed ball bearings. Maintenance is negligible.

WRITE FOR BULLETIN #1138.

BONDED SCALE AND MACHINE COMPANY

PHONE Days: Hickory 4-2186
2190 S. Third St.

WRITE FOR FREE CATALOG AND PRICES

PHONE Evenings: AX. 1-2213
COLUMBUS 7, OHIO

Mfrs. of Scales, Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers, Feeders & Bucket Elevators

COAL TREATING PLANT

1—Complete Viking Oiling System, type #EDPU-10001, 3/60/440 volts, complete with heating unit, and two 25,000 gallon storage tanks.

COPPER

Several Thousand Feet 1,000,000 CM New Weatherproof
Several Thousand Feet 750,000 CM New Bare Stranded
Several Thousand Feet 350,000 CM New Weatherproof
Several Thousand Feet 350,000 CM New Bare Stranded

CONVEYORS

1—Stephens Adamson 36" rubber belt slope conveyor, 725 feet long, complete with approximately 1455 feet of 36" Goodyear special belt like new, 50 HP ball bearing AC motor and speed reducer, and 36" magnetic head pulley. Conveyor used very few months and is actually like brand new.
1—Hewitt Robins 42" belt conveyor, length 390 feet center to center. Complete with head and tail sections, pans, idler troughs, return idlers and approximately 820 feet of 42" rubber belt.
1—Hewitt Robins slope conveyor, length 603' center to center, complete with head and tail sections, pans, idler troughs, return idlers, 250 HP AC motor, 1280 feet of 6 ply 42" rubber belt used one year and like new.

MINING MACHINES

7—10RU Joy Mining Machines, 250 volts DC, complete with permissible plates. Can be bought at a bargain price.

2—512 E.H. Goodman Shortwall hydraulic mining machines, 210 volts DC, 7 1/2" cutter bars, each has permissible plate.

MOTOR GENERATOR SETS

4—200 KW Allis Chalmers, new type bought in 1948, and used a very short time. DC end 250-275 volts, 723 amps, compound wound, 1200 RPM, direct connected to 300 HP Allis Chalmers synchronous motor, 3/60/2300 volts, 1200 RPM, complete with Clark fully automatic AC and DC enclosed portable controls. These units are like brand new.
3—150 KW General Electric MG sets, DC end 250 volts, 500 amps, 1200 RPM, direct connected to 225 HP GE synchronous motor 3/60/2300 volts, 56 amps, 1200 RPM, complete with AC and DC switchboard including automatic DC circuit breaker.
2—300 KW Allis Chalmers rotary converters, 2300 volts AC, 250 volts DC, 1200 RPM, each complete with bank of 3 transformers, and switchboard.

LOADERS

7—11RU-11APE Joy, 250 volts DC, ready to go to work at a bargain price.
2—14RU-TBE Joy, 250 volts DC, each has permissible plate, and ready to go to work.

SHUTTLE CARS

2—58C-TBE Joy shuttle cars, hydraulic elevating discharge.
9—42E Joy Shuttle Cars, hydraulic elevating discharge. These will be sold at a bargain price.

GAVENDA BROTHERS, Inc., Canton, Ill.

PHONES: 739 and 2438

RAVEN MINING EQUIPMENT COMPANY

Good Used Equipment—Priced to Save You Money

Joy 9-E Late Type Loader
Long 400 Chain Conveyor
Joy F-12 Chain Conveyor
Face Conveyor
Goodman Shaker Conveyors
Locomotives 3 to 10 Tons
Pumps—Fans—AC or DC
Sub Stations 100 to 300 KW
Mine Cars—Low Vein

Low-Vein Air Compressor
Crusher—Feeder
Cutting Machines—DC
Jeffrey 35-B, 35-BB, 35-L
Sullivan 11-B, CE-6
Goodman 212-AA, 312, 412
Goodman 212-AA-AC
Battery Motor-Cars
Trucks & Pony Trucks
Transformers 5 to 75 KVA

Goodman Locomotives:
8-30 4 Ton, 24" Low
10-30 5 Ton, 25" Low
Low Pan T Truck
Jeffrey Jig Washer
Wire & Fittings
Rail & Truck Supplies
Low Head 2-deck Screen
Car Spotting Hoists

C. T. ADAIR—P. O. Raven, Va.—Phone Richlands WO 1-9356 Day—Night WO 1-9357

1—14 BU Joy AC Loader
2—512 Goodman Machine with Duster AC
3—400L Long Conveyor complete
2—212AA Goodman Cutting Machine
3—35L Jeffrey Cutting Machine
1—600 Ton Steel Bin Like New

ROTARY CONVERTER

3—750 KW 600 volt 1200 RPM Westinghouse Serial Number over 8 Millions Fabricated Base
1—500 KW 600 Volt 1200 RPM Westinghouse
2—500 KW Westinghouse 250/275 volt 1200 RPM
1—300 KW Westinghouse 1200 RPM
2—370 KW G.E. HCC6 Form P 1200 RPM
2—200 KW G.E. HCC6 Form P 1200 RPM
2—150 KW Westinghouse 1200 RPM
1—100 KW G.E. TC66 Form P 1200 RPM
2—100 KW Westinghouse 1200 RPM

Transformers any voltage for above switching gear, & panel boards.
Mining machines, ITE circuit breaker, hoist, transformers and other items too numerous to mention.
J. M. ALLARA COMPANY
JAEGER, W. VA.
WELLS—88072 Shop, WELLS—82156 or 8270 Night

20# - 30# - 40#
NEW RAIL IN STOCK
LEFTON INDUSTRIAL CORP.
Genl. Office: 212 Victor St.
St. Louis 4, Mo.

PIPE

500,000 ft 10 1/2" O.D. 35#
200,000 ft 12 1/2" O.D. 40#
200,000 ft 8 1/2" O.D. 28#
20,000 ft 16" O.D. 42#

All Machine Cleaned, Plain End. No. 1 Grade.
INDIANA-OHIO PIPE CO.
P.O. BOX 5412 Shepard Sta. Phone CL. 3-5527
COLUMBUS 19, OHIO

BUCYRUS 450-W diesel-elec. walking dragline, 165' bm., 12 yd. bkt. (Canada).
BUCYRUS 15-W electric walking dragline, 200' bm., 14 yd. bkt. good, reduced (England).
WASHINGTON 50 ton elec. Whirley portal gantry traveling crane, 120' bm., 34' high.
LOCOMOTIVES, diesel 30, 44, 65, 80 tons.
SHOVELS, 2 1/2 to 20 yds. Locomotive cranes.
(contact) H. Y. SMITH CO.
828 N. Broadway Milwaukee, Wis.

"FASTER FROM FOSTER"

RAIL

& ALL TRACK EQUIPMENT

Nation's Largest Warehouse Stocks

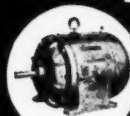
L. B. FOSTER CO.

PITTSBURGH 30 • ATLANTA 8 • NEW YORK 7
CHICAGO 4 • HOUSTON 2 • LOS ANGELES 5

If there is anything you want that other readers can supply OR . . . something you don't want—that other readers can use—
Advertise it in the
SEARCHLIGHT SECTION

POWER EQUIPMENT CO. Offers

BARGAIN PRICES



ON GUARANTEED NEW and Rebuilt MOTORS!

JAN. SPECIALS

GUARANTEED REBUILT MOTORS
230 Volt DC Compound Wound Unless Otherwise Noted

HP	MAKE	TYPE	SPEED
100	West. S.B. Open	SK-142L	1800
100	West. S.B. Open	SK-170	900
75	West. S.B. Open	SK-140L	1800
75	West. S.B. Open	SK-160	900
60	Al. Chal. S. B. Drip	DE-131	1200
45	G.E.S.B. Open, Shunt	RC-14	1200
40	Century S.B. Drip-New	DN-375	1800
30	West. S.B. Open, Shunt	SK-113	1200
25	West. S.B. Open	SK-100L	1200
25	G.E.S.B. Shunt	CD-93	1200
12	G.E.S.B. Splash	CD-85	1800
10	West. S.B. Drip	SK-43	1800
10	West. S.B. Drip	CSP-324	1800
7 1/2	G.E. T.E.F.C. S.B. New	B-284	1800
5	L.A.B.B. Drip	OGNA-254	1800

Send for our FREE Catalog

Cash for your surplus new & used electric equipment.
Send your list today.

Large line of motors, control equipment, AC & DC Generators, MG sets and transformers.

Phone or Wire Us Collect



POWER EQUIPMENT CO.
8 Cairn St., Rochester 2, N. Y.
Phone BEverly 5-1662

HEAVY EXCAVATION EQUIPMENT

Draglines, Shovels, Cranes, Drills, Trucks

15-W B.E. Elec. Drag, 215', 12 yd.
450-W B.E. Diesel Drag, 165' with extra 10, 12, 13 and 14 yd. buckets.
9-W B.E. Elec. Drag, 165', 10 yd.
9-W B.E. Diesel Drag, 165', 12 yd.
7-W B.E. Diesel Drag, 140', 7 yd.
7400 Marion Diesel Drag, 175', 13 yd.
625 Page Diesel Drag, 150', 10 yd.
621-S Page Diesel Drag, 125', 7 yd.
200-W B.E. Diesel Drag, 125', 7 yd.
5-W B.E. Diesel Drag, 100', 6 yd.
2400 Lima Dragline, 130', 5 yd.
4500 Manitowoc Drag, 120', 5 yd.
120-B B.E. Elec. Drag, 115', 5 yd.
111-M Marion Drag, 100', 4 yd.
1601 Lima 4 Yd. Shovel/Drum
3900, 3500 & 3000 Manitowoc Cranes
5560 Marion 26 Yd. Elec. Shovel
5480 Marion 18 Yd. Elec. H.L. Shovel
151-M Marion 7 Yd. Elec. Shovel
170-B B.E. 6 1/2 Yd. Elec. Shovel
4161 Marion 6 Yd. Elec. Shovel
2400 Lima 4 1/2 and 5 1/2 Yd. H.L. Shovels
120-B B.E. 4 Yd. Elec. Shovel
4500 Manitowoc 5 Yd. H.L. Shovel
1201 Lima 3 1/2 Yd. Standard Shovel
111-M Marion Standard & H.L. Shovel
3500 Manitowoc Standard & H.L. Shovels
54-B B.E. Standard & H.L. Shovels
Model T-650 REICHDrill, Truck Mounted Rotary and Down-The-Hole
Ingersoll-Rand Truck Mounted Drillmaster
Joy Truck Mounted Rotary Air Drill, 6" Holes
McCarthy & Compton Coal Auger Drills
Euclid Trucks, Truck Cranes, Dozers, Attachments
FRANK SWABB EQUIPMENT CO., INC.
313 Hazleton Nat'l Bank Bldg.
Hazleton, Pa. Gladstone 5-3658

-ADVERTISERS IN THIS ISSUE-

*Indicates more product information may be found in company advertising appearing in COAL AGE 1959 July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.

*Acme Hamilton Manufacturing Corp. 64	*International Harvester Co. Payhauler..... 61	*Sanford-Day Iron Works 149
*Aeroquip Corp. 91	International Harvester Co. 62-63	Searchlight Section 156-162
*Airdox Cardox Products Co. 24-25	International Salt Co. Inc. 148	*Simplex Wire & Cable Co. 47
*Allegheny Ludlum Steel Corp. 144	*Jeffrey Manufacturing Co. 16-17	*Spencer Chemical Co. 45
*Allis Chalmers 40-41	Jones & Laughlin Steel Co. 34-35	*Standler Corp. W. R. 57
Allison Div. General Motors 50-51	*Joy Manufacturing Co. 12-13, 49, 142	*Standard Oil Co. of Indiana 23
*ACF Industries Inc. American Car & Foundry Div. Third Cover	Kelly Manufacturing Co. 14	*Templeton, Kenly & Co. 116
*American Pulverizer Co. 46	*Kennametal Inc. 54-55	*Texaco Inc. 147
Austin Powder Co. 154	Leco Machinery & Engineering Co. Second Cover	*Union Wire Rope Co. 18-19
*Automatic Vulcanizers Corp. 142	*Lee-Norse Co. 15	*United States Rubber Co. Mechanical Goods Div. 10
*Bethlehem Steel Co. 23, 125, 131	*LeRoi Div. Westinghouse Air Brake Co. 32	*Vascoloy-Ramet Corp. 139
*Bird Machine Co. 4	*LeTourneau-Westinghouse Co. 112-113	*Vietaulic Co. of America 42
*Broderick & Bascom Rope Co. 37	*Linatex Co. of America 14	*Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp. 14, 145
*Caterpillar Tractor Co. 48, 133, 164	*Link Belt Co. Fourth Cover	Wild Heerbrugg Instruments Inc. 153
*Combustion Engineering Co. 36	*Long Co. 58-59	
*Cross Perforated Metal Plant, National Standard Co. 121	*Lukens Steel Co. 103	
*Deister Concentrator Co. 86	*Manhattan Rubber Div. Raybestos-Manhattan Inc. 87	
Denver Equipment Co. 31	*Manitowoc Engineering Corp. 33	
*Differential Steel Car Co. 60	*Marion Power Shovel Co. 155	
*Dodge Div. Chrysler Corp. 150	*McLanahan & Stone Corp. 146	
Dodge Manufacturing Co. 20	*McNally Pittsburg Manufacturing Co. 140	
*Dorr-Oliver Inc. 128-129	*Mine Safety Appliances Co. 8	
Dowell Div. Dow Chemical Co. 117	*National Malleable & Steel Castings Co. 27	
du Pont de Nemours & Co., Inc. (Explosives Div.) 123	*National Mine Service Co. 2	
*Falk Corp. 135	*Nolan Co. 52	
*Federal Mogul Service Div. Federal-Mogul-Bower Bearings Inc. 6	North American Gear Co. 138	
*Flood City Brass & Electric Co. 122	*Ohio Brass Co. 127	
Ford Motor Co. 98-99	Phelps Dodge Copper Products Corp. 39	
*Galis Electric & Machine Co. 44	*PLM Products Inc. 102	
*Goodman Manufacturing Co. 21	*Post-Glover Electric Co. 111	
*Goodrich Industrial Products Co. B.F. 1	Prox Co. Inc. Frank 29	
Goodrich Tire Co. Div. B. F. Goodrich Co. 137	Reliance Electric Co. 3	
*Gundlach Machine Co. 143	*Roberts & Schaefer Co. 151	
*Guyan Machinery Co. 48	*Roehling Sons Corp. John A. 43, 141	
*Hendrick Manufacturing Co. 152	*Rome Cable Co. 53	
*Heyl & Patterson Inc. 56		

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

PROFESSIONAL SERVICES 157
EMPLOYMENT OPPORTUNITIES 157

EQUIPMENT

(Used or Surplus New)
For Sale 157-162

ADVERTISING SALES STAFF

Atlanta 3 Wm. O. Crank, 1301 Rhodes-Haverty Bldg., Jackson 3-6951
Chicago 14 G. A. Mack, F. W. Roets, 529 N. Michigan Ave., Mohawk 4-5800
Cleveland 13 W. W. Forsyth, 55 Public Square, Superior 1-7000
Dallas 1 F. E. Holland, 1712 Commerce St., Riverside 7-5117
Denver 2 J. W. Patten, Tower Building, 1700 Broadway, Alpine 5-2981
Los Angeles 17 P. Carberry, 1125 W. 6th St., Madison 6-9351
New York 36 H. C. Chellson, R. Peckham, 500 5th Ave., Oxford 5-5959
Pittsburgh 22 Wm. H. H. Ginder, 1111 Oliver Bldg., EXpress 1-1314
Philadelphia 3 J. B. Lewis, 6 Penn Center Plaza, Philadelphia 3, Locust 8-4330
St. Louis 8 F. W. Roets, Continental Bldg., 3615 Olive St., Jefferson 5-4867
San Francisco 4 J. W. Otterson, 68 Post St., Douglas 2-4600
Europe E. E. Schirmer, McGraw-Hill House, 95 Farringdon St., London E.C. 4, England
Stanley Kimes, 85 Westendstrasse, Frankfurt/Main, Germany. Telephone 772665 773059

Special report to owners of Traxcavators, D6 and D4 Tractors



Parts you can trust
Dependable round-the-clock service

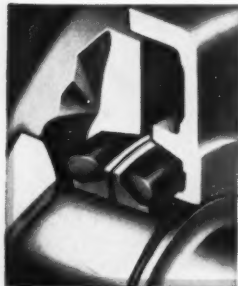
Now available...lifetime lubricated rollers...two-way savings...

ELIMINATE MAINTENANCE GIVE LONGER LIFE

Here's another cost-cutting improvement for Traxcavators and both D6 and D4 Tractors... lifetime lubricated rollers. Now you can eliminate on-the-job shutdowns for greasing. And you get longer life from rims, flanges, internal parts. The payoff... reduced replacement costs, savings in time.

How maintenance is eliminated—the new Cat-built rollers are lubricated when first installed. They are equipped with floating ring seals that keep lubricant in... grit out... for the life of the rollers. Only when rollers are disassembled for rebuilding will relubrication be necessary. And the original metal rings can be reused.

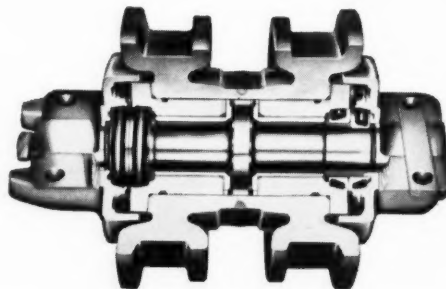
New floating ring seal... only four parts, no springs. The roller seal employs two alloy metal rings and two rubber "O" rings. The metal rings, much harder than the best file steel, have lapped faces, smoother than glass. These faces taper slightly toward the inner edge forming a sealing area at the outer edge. As wear occurs, the sealing area moves gradually inward, maintaining a perfect seal for thousands of hours.



The "O" rings keep constant pressure on the metal rings. Lubricant can't get out. Grit can't get in. There are no springs or diaphragms to weaken, wear or become damaged. The "O" rings are made of special compound to resist oil, heat, cold.

Why do roller parts last longer? Grit is permanently sealed out. Big lubricant reservoirs (with strategically located oil passages) insure ample supply of lubricant to moving parts. Oil instead of grease is used for roller lubricant. Oil dissipates heat faster, circulates more freely than grease. These features assure you of longer shaft and bearing life.

Longer bushings with extra-thick flange assures rigid support. Large sleeve bearings provide ample bearing area. Larger diameter, deep-hardened shafts withstand higher shock loads. Beam strength has been increased 63% for D6 shafts; 185% for D4 shafts. Resistance to side thrust is



greatly increased in D4 shafts by a 25% wider center flange and 73% more thrust-bearing area.

Why do rims and flanges last longer? The new two-piece roller shell has greater strength and impact resistance. Special heat-treat process provides extra-hard and deep wear surfaces. Ample steel under tread gives strong support to resist shock loads. Thicker flanges combat peening over. Overlapping center joint maintains rigid shell without separate hub.

Easy installation is achieved by use of snap rings to hold the seals and end collars in place before mounting. End collar bolt holes will line up easily with track roller frame holes during installation.

Millions of hours of proof—the toughest track rollers yet. Cat lifetime lubricated rollers have been subjected to extensive and exhaustive on-the-job tests for over 5 years. Working on all types of job conditions, these time-tested rollers have proved to be unequalled. And machine-owner reports prove that Cat lifetime lubricated rollers can't be beaten for low-cost, minimum maintenance operation.

See your Caterpillar Dealer. He'll give you the full story on this time-saving, money-saving undercarriage component.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

SERVICE TIP:

When rebuild time finally comes, be sure to keep the metal rings matched in original pairs, being careful not to nick or mar the lapped surfaces.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

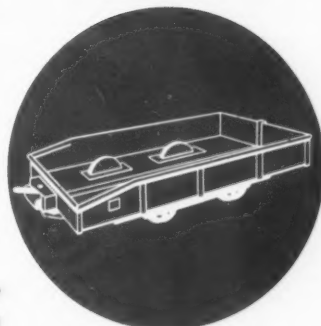
DROP BOTTOM

4 wheel or 8 wheel



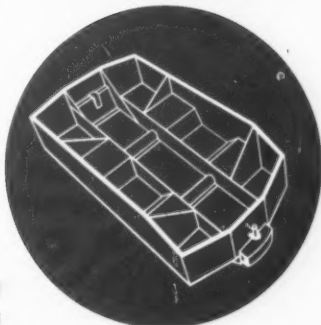
END DUMP

4 wheel



ROTARY DUMP

4 wheel or 8 wheel



acf **MAKES ALL THREE**

No matter what type of car your mining operations call for **ACF** has a car to fit your needs. **ACF** mine cars are built in all types and sizes from 2 to 30 tons, or more.

For safety, low maintenance and high speed constant haulage all **ACF** mine cars have special features developed through many years of experience in design and manufacture.

Anti-friction bearings in the load-support wheels permit safe high speed from loading point to unloading point and back again for more. Automatic couplers make car handling safer and faster. **ACF** double-action spring bumpers lower maintenance on everything from trackage to locomotive... provide smoother, safer hauling.

For complete information about the full line of **ACF** Constant Haulage Mine Cars in all sizes and types contact the nearest **ACF** sales office or discuss your haulage problems with one of our sales representatives.

AMERICAN CAR AND FOUNDRY

Division of **ACF** Industries, Inc.

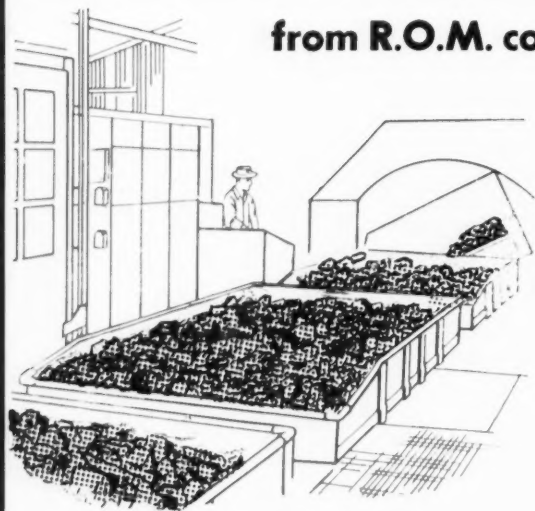
750 Third Avenue, N. Y. 17, N. Y.

SALES OFFICES:

NEW YORK
PHILADELPHIA
BERWICK, PA.
WASHINGTON, D. C.
CLEVELAND
HUNTINGTON, WEST VA.
CHICAGO
ST. LOUIS
SAN FRANCISCO

from R.O.M. coal to finished product...

LINK-BELT takes it all the way..



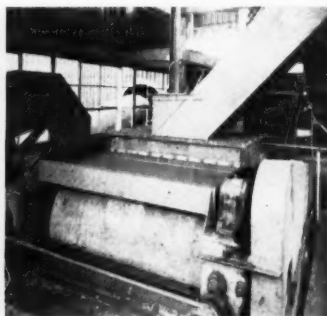
DUMPING — Rotary mine car dumpers, car hauls, refuse car dumpers and feeders.

Yes, a complete line of coal handling and processing equipment plus more than 60 years' experience in the field enables Link-Belt to fulfill any coal preparation need. This includes designing, fabricating and erecting complete facilities or modernizing your present installation. Our experienced erection crews carry the job through to final completion including training of operating personnel.

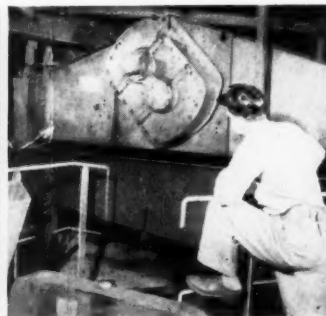
For power transmission products as well, Link-Belt can supply them all from its full range of chains, sprockets, bearings, speed reducers and other equipment. Contact your nearest Link-Belt office for full information. Or write for Book 2655 on Link-Belt equipment for coal preparation.



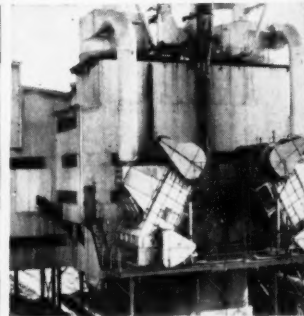
CONVEYING — Link-Belt belt conveyors are coal plant standards for both horizontal and slope conveying. Also flight, apron, screw and oscillating types plus bucket elevators.



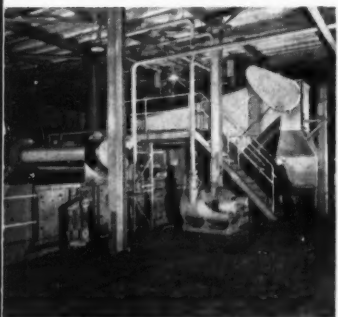
CRUSHING — Link-Belt crushers are both rugged and efficient. Three types—single roll, double roll and adjustable double roll—are available to meet every requirement.



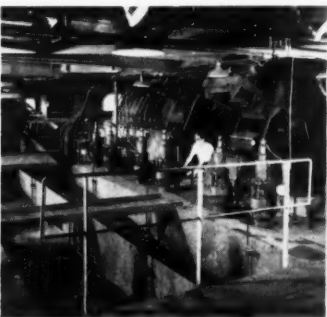
SCREENING — Classification is done quickly with minimum degradation by Link-Belt liquid and dry vibrating screens. A wide range of types and sizes are available.



DRYING — By drying quickly, safely and uniformly, Link-Belt coal dryers assure a highly marketable coal at a low cost per ton.



CLEANING: TANK-TYPE CONCENTRATOR uses principle of float-sink separation in a magnetite and water mixture. A drum-type is also available to suit varying coal conditions.



AIR-PULSATED WASH BOXES — Single and double bed types to satisfy all capacities. Both with new, automatic refuse discharge control. Also Link-Belt trough separators.



WATER CLARIFICATION — You conserve water and recover fine coal with Link-Belt water clarification equipment... thickeners, drag tanks, settling cones, screw classifiers.



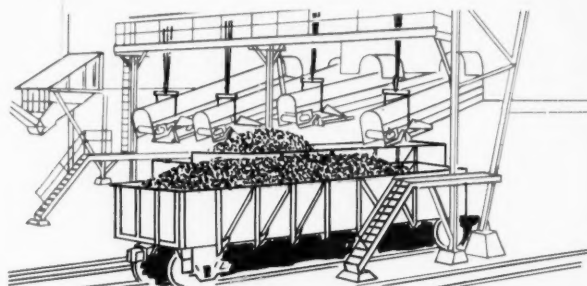
REFUSE DISPOSAL — Link-Belt conveyor systems handle such rejects as table refuse, crushed mine rock and dryer furnace ash. Link-Belt refuse dumpers also aid in disposal.

LINK-BELT

COAL PREPARATION AND HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Birmingham 9, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1, Salt Lake City 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarborough (Toronto 13); South Africa, Springs. Representatives Throughout the World.

15, 102



LOADING — Booms, barge shifters, gates, car spotters and pullers.

